THE MAGAZINE OF PROPHETIC FICTION

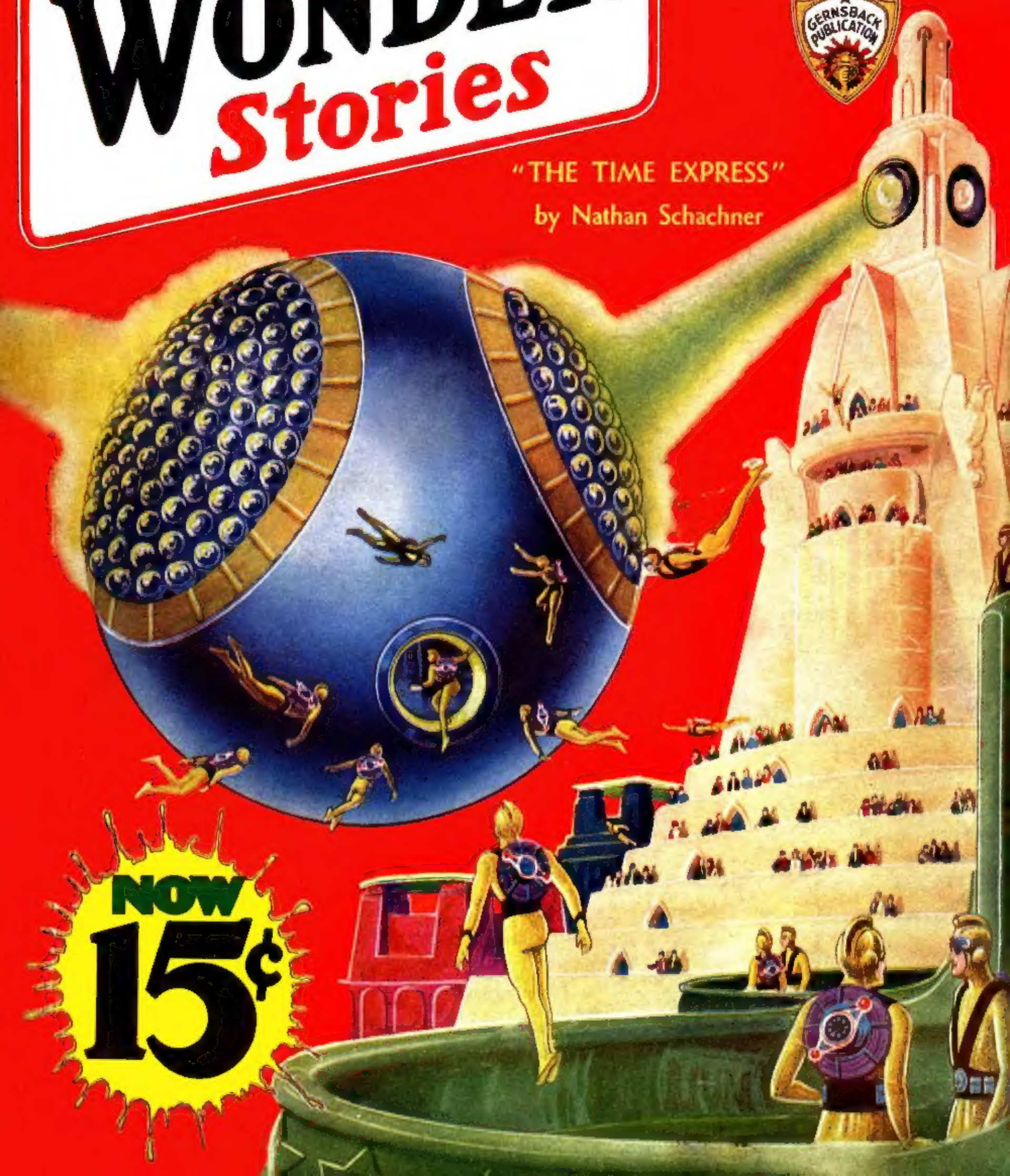
December

WONDER Stories

HUGO GERNSBACK
Editor

A GERNSBACK PUBLICATION

"THE TIME EXPRESS"
by Nathan Schachner



NOW 15¢

STELLAR PUBLISHING CORPORATION
96-98 Park Place, New York, N. Y.

I am enclosing herewith my remittance of $..... for which you are to send me the numbers of books in the SCIENCE FICTION SERIES which I have circled below, at the price of 10c each or Six Books for Fifty cents. No less than three books are sold. Send remittance in check, stamps or money order. The numbers of the books that I want are circled below.

13 14 15 16 17 18

Name.....

Address.....

City.....

State.....

WS-1-33

6 New Titles HAVE BEEN ADDED TO THE SCIENCE FICTION SERIES

CLIP COUPON AND MAIL

THE increasing demand by our readers for new titles to be added to the SCIENCE FICTION SERIES has now been met. Six new books have been published and are now ready. Many new authors have contributed excellent stories which you will enjoy reading. A short summary of the new titles will be found below.

These new books, as usual, are printed on a good grade of paper, and contain brand new stories never published before in any magazine.

Each book (size 6x8 inches) contains one or two stories by a well-known science fiction author.

The New Titles Are:

13—MEN FROM THE METEOR

by Panzie E. Black

In the unexplored heart of Australia lay the bizarre and cruel civilization of the meteormen. And into their midst came the two men from Outside, to pit their puny strength against the meteormen's power.

14—THE FLIGHT OF THE AEROFIX

by Maurice Renard

Renard is the H. G. Wells of France. With sly humor and yet grim reality he describes the most unusual and startling flight made by man. An entirely new type of transportation dawns upon the world in this masterly story!

15—THE INVADING ASTEROID

by Manly Wade Wellman

Into the vision of the Earth swam the huge but innocent asteroid. Mars, at death grips with the Earth, was far away; but the asteroid loomed ominous, menacing. Two men were delegated to solve the mystery; and what they found is revealed in this startling story.

16—IMMORTALS OF MERCURY

by Clark Ashton Smith

Under the sun-parched surface of Mercury, we follow in this story, the experiences of a man, reminiscent of Dante's Inferno. Every force of grotesque nature, the bitter enmity of the Immortals track him down in his wild escape to the surface.

17—THE SPECTRE BULLET

by Thomas Mack

and

THE AVENGING NOTE

by Alfred Sprissler

are two surprises for the lovers of scientific detective mysteries. Death strikes suddenly in these stories; clever scientific minds and cleverer detectives are pitted against each other in a duel with Death.

18—THE SHIP FROM NOWHERE

by Sidney Patzer

A trip to infinity is this unusual story; a mad chase across the infinite emptiness, tracked always by the avenging Marauder. Here is a story that deals with millions of years and billions of billions of miles.

10c EACH OR 6 FOR 50c

STELLAR PUBLISHING CORPORATION

96-98 Park Place New York, N. Y.

ARE YOU "SET" TO START THE RACE TO BETTER TIMES ?

The TRAINED MAN always Wins!

It's just as true—or even truer—in business as in sport. The man with real, practical TRAINING is the one to win. Now that business is returning to normal there's going to be a harder race to win the prizes of big-pay jobs, independence and a future, than ever before. Are you "all set" to race? Have you the necessary TRAINING to bring you in among the winners! If not, DON'T WAIT! Get the training NOW, while there's still time!

Get Your Training for Work in Profitable

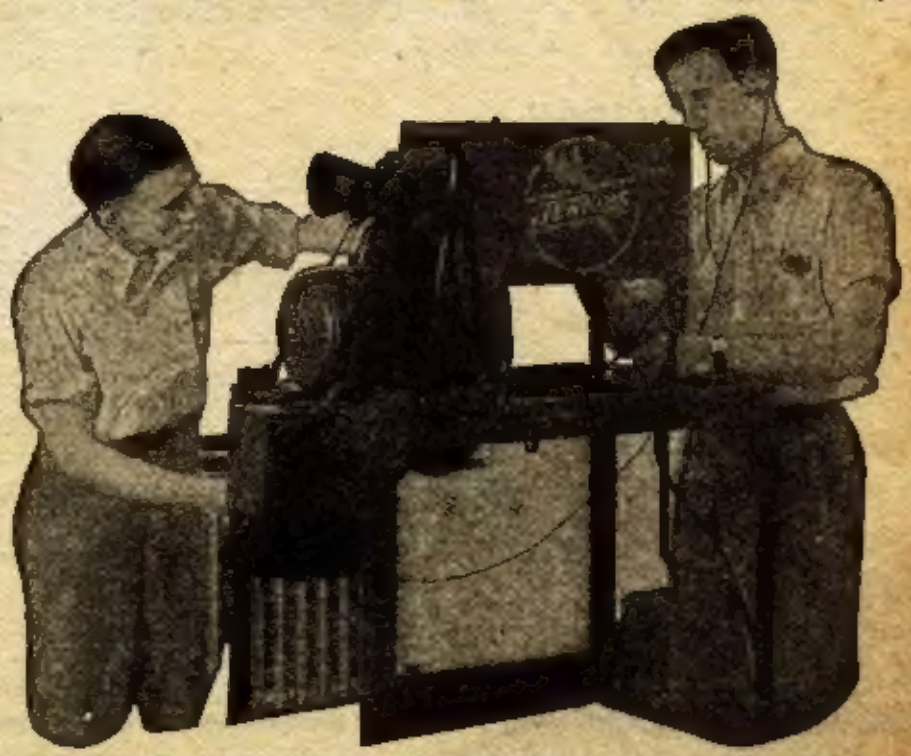
RADIO-TELEVISION

in the Great Coyne School in Only 10 Weeks

Here's the most fascinating, fastest-growing field in the world today. In Radio there are thousands of jobs paying BIG MONEY—up to $50 a week and more. COYNE TRAINING fits you to hold better jobs—prepare to be a Designer, Inspector or Tester . . . a Radio Salesman, Service or Installation Man . . . Operator or Manager of a Broadcasting Station . . . a Wireless Operator on a Ship or Airplane . . . Coyne trains you, too, for Talking Picture and Television and Sound Work! In just a few short weeks, by exclusive Coyne methods, you are trained for a future that holds marvelous opportunities for top-notch salaries, or for a business of your own and real independence. Find out about this great game—get all particulars—see how simple it is for any ambitious man to get into it with the help of this great, nationally-recognized school.

LEARN BY *DOING*—NO BOOK STUDY

When you come to COYNE for training you start right in doing practical, interesting work on the greatest layout of Radio, Television and Sound Equipment you ever dreamed of seeing. Scores of the most up-to-minute Radio Receivers, real Broadcasting Equipment, latest Television Apparatus, Talking Picture and Sound Reproduction Equipment, Code Practice Equipment, etc., are here for you to use and learn by actual operation, servicing and repair. Previous experience or advanced education isn't needed. The useless theory—the tedious book study—is cut out by COYNE methods. We replace it with actual practice and experience in modern, completely equipped shops in our own huge building. The result is that you get more training in 10 weeks at COYNE than you ordinarily could in long months of tiresome book study.



Earn as You Learn — We'll Help You

Don't let lack of ready cash hold you back in getting the TRAINING you must have to be a winner. Many COYNE students make all or a good share of their living expenses while going to school. If you need that kind of help just let me know. We run an efficient Employment Service to help you get spare-time employment while you are here—and that aids you in finding full-time jobs whenever you need them during your whole life. COYNE has been training men for nearly a THIRD OF A CENTURY—its value has been tested and proven by thousands of men who are now successful and happy. YOU can have a future like that—YOU can be one of the winners in the race of life. Why not learn how easy it is?

SEND *NOW* FOR BIG FREE BOOK

Just mail the Coupon! It will bring you a thrilling big book, illustrated with actual photographs taken in COYNE SHOPS and showing how our methods TRAIN you so practically that employers are glad to have you if you have a background of COYNE TRAINING. This book tells you everything you want to know about the tremendous RADIO FIELD—describes the vast opportunities that exist in it—tells about the future in it for men who know. It's a book of FACTS that is more fascinating than fiction. You'll enjoy every word of it—and it may be the means of starting you on a real, successful, prosperous career. GET IT AT ONCE. Just mail the coupon!

COYNE ELECTRICAL SCHOOL

H. C. LEWIS, President — Founded 1899

500 S. Pauline St., Dept. 92-2M CHICAGO, ILL.

H. C. Lewis, President,
Radio Division, Coyne Electrical School,
500 S. Paulina St., Dept. 92-2M, Chicago, Ill.

Dear Mr. Lewis: Send me your Big, FREE Radio Book, and tell me how I can get the TRAINING that will make me a WINNER.

NAME_____

ADDRESS_____

CITY_____ STATE_____

The Magazine of Prophetic Fiction

WONDER Stories

CONTENTS FOR DECEMBER, 1932

THE WRECK OF THE ASTEROID
(In Three Parts—Part One)
by Laurence Manning.....550
Stranded on lifeless Mars . . . thirst tortured them . . . above them within reach lay rescue . . .

THE TIME EXPRESS
by Nathan Schachner.....562
Who was the smuggler of forbidden machines into the future? . . . death awaited his discovery . . .

THE PLANETOID OF DOOM
by Morrison Colladay.....574
Like an avenging tide, the sea swept upon the hapless world . . . from the depths came horrible monsters . . .

SPACE RAYS
by John W. Campbell, Jr......584
As strong as ten men, he was, this man of Jupiter . . . and when the conflict came in the control room . . .

THE DEATH OF IRON
(Conclusion)
by S. S. Held.....594
A new world was arising on the ash-heap of the old . . . a chastened race was facing the future . . .

PRIZE LETTERS—
September Cover Contest.....603

SCIENCE QUESTIONS AND ANSWERS.....605

THE READER SPEAKS—
Letters from Readers.....606

ON THE COVER THIS MONTH

taken from Nathan Schachner's "Time Express" we see the men of the future, with atomic motors strapped to their backs, flying up swiftly to the sphere suspended in the air. The beams from power houses converging upon the sphere support it freely.

NEXT MONTH

The Memory of the Atoms
by NATHAN SCHACHNER and R. LACHER

Suppose that in the dark unknown past there resided a secret of incalculable value to the race, what might be done to recover it if all records were lost? That, in a sense, is the background of this unusual story. We know that in a sense we never forget anything of our personal experiences. But do we remember what our forefathers have passed through? And if we do how might we recover that memory? And if tremendous wealth and fame were the stake, what drama, what passions might be aroused? This exciting story portrays such an intrigue for great stakes.

The Last of the Lemurians
by ARTHUR G. STANGLAND

Much has been written about the Lemurians—vanished race of the Pacific, that was the counterpart of the Atlantians. Mr. Stangland has studied the legend carefully and formed his own ideas about them. This story is the result—of two men thrown without warning into an adventure as unusual as men can conceive. The ending to this story will surprise everyone—that is all except those who read and follow closely Mr. Gernsback's editorials. In one of the editorials will be found the key to this story.

The Messenger from Space
by D. D. SHARP

In this issue, Mr. Colladay constructs an exciting story about the newly discovered asteroid that comes within a few million miles of the earth in its long pilgrimage about the sun. Mr. Sharp has taken the same theme but with an entirely different viewpoint. He sees these space messengers as means of free transportation—and if we can once get aboard the planetoid we can have a free ride around the solar system. The idea is intensely exciting, and in this story our author develops an unusual series of events.

The Wreck of the Asteriod
by LAURENCE MANNING

goes into its exciting phases in this installment. Thirst . . . horrible enemies . . . hunger . . . cold assail our explorers on lifeless Mars . . .

Published by STELLAR PUBLISHING CORPORATION, H. GERNSBACK, Pres., S. GERNSBACK, Treas., I. S. MANHEIMER, Sec'y.
Publication Office, 404 North Wesley Avenue, Mount Morris, Illinois. Editorial and General Offices, 96-98 Park Place, New York

WONDER STORIES—Monthly—Entered as second-class matter September 29, 1931, at the post office at Mount Morris, Illinois, under the Act of March 3, 1879. Title registered U. S. Patent Office. Trademarks and copyrights by permission of Gernsback Publications, Inc., 98 Park Place, New York City, owner of all trademark rights. Copyright, 1932, by Gernsback Publications, Inc. Text and illustrations of this magazine are copyrighted and must not be reproduced without permission of the copyright owners.

WONDER STORIES is published on the 3rd of the preceding month. 12 numbers per year, subscription price is $1.50 a year in United States, and its possessions. In foreign countries, exclusive of Canada, $2.00 a year. Single copies 15c.

Address all contributions for publication to Editor, WONDER STORIES, 96-98 Park Place, New York. Publishers are not responsible for lost MSS. Contributions cannot be returned unless authors remit full postage.

WONDER STORIES is for sale at principal newsstands in the United States and Canada.

IF YOU WISH TO SUBSCRIBE to WONDER STORIES, make out all remittances to the Stellar Publishing Corp. Be sure to mention the name of magazine you wish to subscribe for, as we are also agents for the following magazines: RADIO-CRAFT and EVERYDAY SCIENCE AND MECHANICS, subscription price of which is the same as WONDER STORIES. Subscriptions can be made in combination with the above publications, at a reduced club rate. Ask for information. Subscriptions start with current issue.

WHEN YOUR SUBSCRIPTION EXPIRES, we enclose a renewal blank in the last number. No subscription continued unless renewal remittance received.

CHANGE OF ADDRESS. Always give us old as well as new address and notify us as far in advance as possible.

Chicago Advertising Representative—L. F. McClure, 737 North Michigan Ave.
Western Advertising Representative—Lloyd B. Chappell, 220 No. Catalina St., Los Angeles, Calif.

London Agent: Hachette & Cie., 8 La Belle Sauvage, Ludgate Hill, E. C. 4
Paris Agent: Hachette & Cie., 111 Rue Reaumur
Australian Agents: McGill's Agency, 179 Elizabeth St., Melbourne

where thousands look to find the latest science news, constructional articles for home workshop and money-making ideas . . . . . .

25c
The Copy

Over 450 Illustrations
96 pages—
4-Color Cover
9x12 Inches

WE do not hesitate to say that EVERYDAY SCIENCE AND MECHANICS is the finest *scientific - technical - mechanical - constructional* magazine in the field. Right up-to-the-minute with news flashes of scientific events from all parts of the world. Dozens of constructional articles for making useful things for the shop, garden and home. Many ideas from which you can make things to sell.

Get this magazine at your newsstand today. Read about the many cash prizes which are offered for simple experiments in photography, oddities in science, uses of old auto parts, radio experiments, recipes, formulas and others.

After reading your first issue, you'll agree with us that EVERYDAY SCIENCE AND MECHANICS is all that we claim it to be, and better.

A Host of Interesting Scientific Subjects—

RADIO
TELEVISION
ELECTRICITY
PHOTOGRAPHY
AVIATION
WOODWORKING
AUTOMOBILES
PATENTS AND INVENTIONS
NEW DEVICES
CONSTRUCTION
METAL WORKING
PHYSICS
ENGINEERING
METALLURGY
PUBLIC ADDRESS AND SOUND EQUIPMENT
HOUSEHOLD AND SHOP HINTS
AND OTHERS

SPECIAL OFFER!
8 MONTHS FOR $1.00

Clip Coupon and Mail Today!

EVERYDAY SCIENCE AND MECHANICS
100 Park Place, New York, N. Y. WS-12

I enclose herewith One Dollar for which you are to enter my subscription to EVERYDAY SCIENCE AND MECHANICS for the next Eight Months.

Name _____

Address _____

City _____ State _____

(Foreign or Canadian subscriptions not accepted at this rate.)

Enjoy the Wonders of Nature

with an

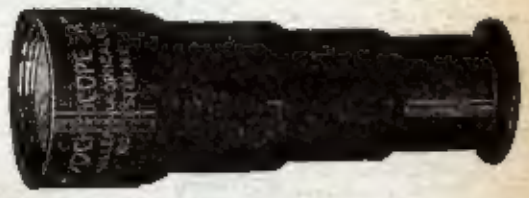
EXTRA POWERFUL

MICROSCOPE or BINOCULARS

THIS season you can enjoy outdoor sports by carrying with you a handy pair of pocket binoculars . . . or facilitate your laboratory work by using a microscope of more powerful design. Or you can even keep in your pocket a small telescope which will often come in handy.

POCKESCOPE

The Pocket Telescope



Not much larger than an ordinary pocket knife and yet it is a wonderfully powerful telescope. Easily focused and capable of enlarging a view many times. Finished in black crystallized lacquer with nickel trimming. Each instrument supplied with leather case. 6-Power, length closed 3¼", Diam. 1 3/16". Price $2.00; 3-Power, length closed 2⅝", Diam. 11/16". Price $1.00.

BIASCOPE

6-Power Pocket Binocular

Compact and light in weight, rugged strength for long use. Focusing device permits accurate adjustment. Furnished with genuine ostrich grain leather case. Excellent for athletic events, motoring, theatre, hunting and camping. Model illustrated, object lens 1" Diam., height extended 3 9/16". Price $5.00.

110-Power Microscope

The convenient size, simple manipulation and precise optical qualities of these Microscopes will appeal to biologists, chemists, geologists, dentists, physicians, laboratory workers and experimenters. Detachable base permits examining large and small objects. Single achromatic lenses, magnifies 50X, 75X, 100X and 110X, non-tilting stand, height extended 8½". Chromium and black lacquer finish. Price complete with case, $10.00.

To order, simply fill in coupon completely and send remittance for full amount, in check or money order. Goods will be delivered promptly. Include sufficient postage to insure safe delivery—any excess will be refunded.

Clip Coupon and Mail!

GRENPARK COMPANY WS-12-32
245 Greenwich St., New York, N. Y.

Enclosed find my remittance for the amount of $..... for which you are to send me the articles checked below. I understand the products to be perfect.

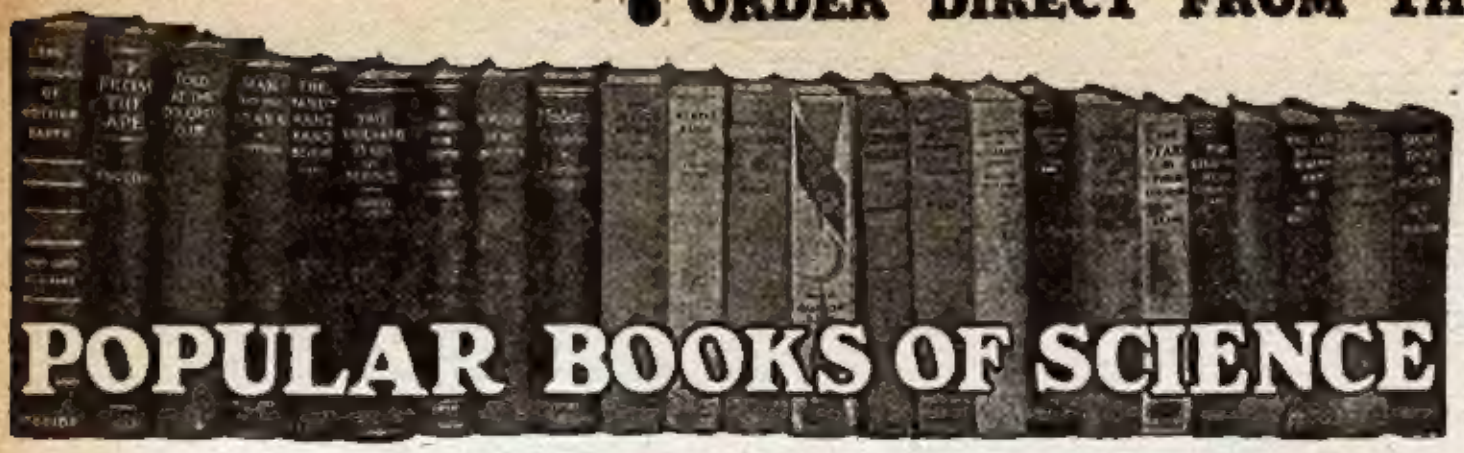
POCKET TELESCOPE
( ) Large size, $2.00
( ) Small size, $1.00
( ) BIASCOPE BINOCULARS $5.00
( ) 110-POWER MICROSCOPE $10.00

Name _____

Address _____

City _____ State _____

● ORDER DIRECT FROM THIS PAGE ●



POPULAR BOOKS OF SCIENCE

WE herewith present the most complete collection of recent important popular Science books. We have, after an exhaustive study, selected these volumes because they represent the foremost books of their kind in print today. There is such a great variety that we are sure it will satisfy any taste as well as any requirement of the student of science.

We publish no catalogues and ask you to be kind enough to order direct from this page. Prompt shipments will be made to you direct from the publishers. We merely act as a clearing house for a number of publishers and OUR PRICES ARE AS LOW OR LOWER THAN WILL BE FOUND ANYWHERE. Remit by money order or certified check. If you send cash, be sure to register it.

ASTRONOMY

MAN AND THE STARS, by Harlan T. Stetson. Cloth covers, size 5½x8¾, 321 pages, illustrated. Price **$2.50**
The story of the adventure of astronomy, from the days when primitive man began wondering about the meaning of the heavens, through the work of the great pioneers of the science to the present day. Profoundly exciting.

DREAMS OF AN ASTRONOMER, by Camille Flammarion. Cloth covers, size 5¾x8½, 318 pages. Price **$2.50**
The study of the heavens by the famous astronomer made as attractive as fiction. One of the most complete and authentic books on the subject ever written.

THE UNIVERSE AROUND US, by Sir James Jeans. Cloth covers, size 5¾x8¾, 361 pages, 32 Illustrations. Price... **$4.50**
A non-technical book which roves through the mysteries of modern physics and astronomy, opening up new vistas for the imagination. The very latest word in physical science. A marvelous work.

SIGNALS FROM THE STARS, by George Ellery Hale. Cloth covers, size 6x8, 138 pages, 24 Illustrations. Price..... **$2.00**
An amazing book on the possibilities of large telescopes, problems in building a 200" mirror telescope, new solar explorations after the magnetic field of the earth and many other fascinating topics.

THE STARS IN THEIR COURSES, by Sir James Jeans. Cloth covers, size 6x8¾, 172 pages, 50 illustrations and maps. Price **$2.50**
Modern astronomy and the wonders of the universe as seen through the giant telescopes of today. An informal conversational style, and simple language has been retained.

POPULAR ASTRONOMY, by Camille Flammarion. Cloth covers, size 6¼x9¾, 636 pages, 201 Illustrations. Price.. **$6.00**
A general description of the heavens written in an interesting and lucid manner for those who wish to acquire a knowledge of astronomy without technicalities.

AVIATION

WINGS OF TOMORROW, by de la Cierva. Cloth cover, size 5½x8¼, 284 pages, 31 illustrations. Price **$2.50**
When the inventor of the most revolutionary aircraft—the autogyro—speaks, we listen with respect. This book is a notable contribution to air transport set forth interestingly and convincingly.

OPPORTUNITIES IN AVIATION, by Walter Hinton. Cloth covers, size 5½x8¼, 256 pages, 14 illustrations, map and charts. Price **$3.00**
This book tells clearly the innumerable opportunities in aviation in flying and servicing phases. Also those which involve design, repairing, selling and equipping planes, etc. Written by the famous aviator.

AVIATION AND ALL ABOUT IT, by A. Frederick Collins. Cloth cover, size 5x7½, 200 pages, 134 illustrations. Price.. **$2.00**
A complete volume covering all phases of aviation. Instructions in model airplane construction and design, in learning to fly, and numerous other aspects of aviation.

CHEMISTRY

THE AMATEUR CHEMIST, by A. Frederick Collins. Cloth covers, size 5x8¼, 210 pages, 77 illustrations. Price **$1.50**
An extremely simple but thoroughly practical chemistry book. A vast amount of practical information is given, also how to make and do things which will save time and money.

EXPERIMENTAL CHEMISTRY, by A. Frederick Collins. Cloth covers, size 5x7½, 276 pages, 188 illustrations. Price **$2.00**
Here is a book that approaches the fascinations of chemistry in a new way. Contains a vast store of interesting and unusual material. THE book for experimenters.

THE MAKING OF CHEMISTRY, by Benjamin Harrow. Cloth covers, size 5½x7¾. Price **$2.00**
A history of chemistry for laymen, told in terms of personal activities of great chemists, with special emphasis on modern industrial chemistry and its contribution to our civilization.

EXPLORATION

TOLD AT THE EXPLORERS CLUB, by Vilhjalmur Stefansson, Sir Hubert Wilkins, Col. Chas. A. Lindbergh, Capt. Felix Riesenberg, Dr. Roy Chapman Andrews and others. Edited by Frederick A. Blossom, Ph.B. Cloth cover, size 6x9, 422 pages, 24 illustrations. Price **$3.50**
A collection of the most thrilling and hair-raising tales of adventure ever gathered between two covers, told by America's greatest explorers. A marvelous book.

GENERAL SCIENCE

TWO THOUSAND YEARS OF SCIENCE, by H. J. Harvey-Gibson. Cloth covers, size 5¾x8¾, 322 pages, fully illustrated. Price **$3.50**
This authoritative work is meeting one of the greatest Science needs of the general reader. Fascinating histories of the great inventors and discoveries with lucid explanations of their work.

UP FROM THE APE, by Harcourt A. Boston. Cloth covers, size 6½x9¾, 605 pages, 88 illustrations. Price **$5.00**
Here is evidence which scientists offer as proof of man's evolution. An amazing array of facts, figures and pictures set forth in an unusually entertaining manner. Whatever your own beliefs, you will find this book of intense interest.

EVOLUTION, by Vernon Kellogg. Cloth covers, size 5½x8¼, 291 pages. Price **$1.75**
A thoroughly human book on a subject concerning which too much that is inaccurate has clouded popular conception. Untechnical but truthful explanations.

EXPERIMENTAL SCIENCE, by A. Frederick Collins. Cloth covers, size 5x7½, 280 pages, 153 illustrations. Price **$2.00**
A wealth of outstanding and surprising experiments are to be found in this book. Not only vastly entertaining, but also highly instructive. The book for amateurs.

SCIENCE TODAY, by Watson Davis. Cloth cover, size 5½x8¼, 310 pages. Price **$2.50**
45 brief talks about the latest things Science has found out—about the sun, moon, stars, the earth, light, electricity, the weather, germs, the past of man, and dozens of other absorbing topics.

SHORT TALKS ON SCIENCE, by Edwin E. Slosson. Cloth covers, size 5x7½, 311 pages, 20 illustrations. Price **$2.00**
This book is a brilliant compound of wisdom, and up-to-date information on what Man and Nature are accomplishing between them. A myriad new angles of science.

WONDERFUL STORY OF SCIENCE, by I. McFee. Cloth covers, size 8½x11, 400 pages, 125 illustrations. Price.. **$2.50**
A complete story of the seven sciences interestingly and clearly told. Answers many questions that come up in every-day science. A most practical book.

MASTERS OF SCIENCE AND INVENTION, by Floyd Darrow. Cloth covers, size 5x8, 303 pages, illustrated. Price **$2.25**
Brief but fascinating biographies of 50 leading scientists from Galileo to Einstein that place each man against the background of the ideas of his time and then show him working out his discovery.

HEALTH

HOW TO LIVE LONGER, by Iago B. Lady, M.D., and John C. Frank. Cloth covers, size 6x7½, 148 pages, 40 illustrations. Price **$1.50**
This book convincingly points the way to the achievement of robust old age. Once begun, you will read straight through—and with great profit.

INVENTION

THE PSYCHOLOGY OF THE INVENTOR, by Joseph Rossman, Ph.D. Cloth covers, size 5¾x8¾, 232 pages, 18 illustrations. Price **$3.00**
A comprehensive picture of the inside of the inventor's mind. Observations from 710 prominent inventors are quoted. Many absorbing topics discussed, also facts never before in print. No inventor should miss it.

MECHANICS

EXPERIMENTAL MECHANICS, by A. Frederick Collins. Cloth covers, size 5x7½, 302 pages, 187 illustrations. Price **$2.00**
The most fascinating book on mechanics. Chuck full with experiments you can make; all mechanical lock and clock movements, as well as perpetual motion in profusion.

THE HANDY MAN'S BOOK, by C. S. Schaefer, M.E. Cloth covers, size 6x8½, 341 pages, 14 illustrations and diagrams. **$4.00**
A complete manual covering every phase of repair and maintenance work in the home, factory, office and farm, readily understood and applied by the non-professional worker. A fine book.

THIS MECHANICAL WORLD, by Morton Mott-Smith, Ph.D. Cloth covers, size 5x7½, 288 pages, 45 illustrations. Price **$2.00**
Both for the student and layman, this book gives a tremendously interesting account of our mechanical civilization, historical as well as modern, as has never been done before.

How to order

We cannot ship C.O.D. Our prices are net, as shown. Please include sufficient postage, for Parcel Post, otherwise books must be shipped by express collect.

MICROSCOPY AND PHOTOGRAPHY

SCIENCE AND PRACTICE OF PHOTOGRAPHY, by John S. Hoebuck. Cloth covers, size 5½x8¾, 238 pages, 92 illustrations. Price **$2.50**
A practical book for the professional and amateur. Covers thoroughly and logically the entire elementary ground of photography. Invaluable information and suggestions.

THE BOOK OF THE MICROSCOPE, by A. Frederick Collins. Cloth covers, size 5x7½, 245 pages, 71 illustrations. Price... **$1.50**
Simple but vivid descriptions of all the wonderfully fascinating uses of the microscope. Plant and animal life, curious hygiene facts, the microscope in criminal investigation are but a few of the subjects discussed. Splendid for experimenters.

MISCELLANEOUS

HOUDINI'S ESCAPES, by Walter Gibson. Cloth covers, size 6x9, 315 pages, illustrated. Price **$2.00**
The first and only authentic record of the actual methods devised and used by Houdini. Explains his modern miracles in non-technical language. Learn how this master accomplished the impossible!

THE AQUARIUM BOOK, by Boulenger. Cloth covers, size 5¾x8¾, 206 pages, 87 illustrations. Price **$3.50**
Just the book for those interested in home aquariums. Covers the subject clearly and thoroughly with many helpful suggestions.

MOTION PICTURES

THE TALKIES, by Arthur Edwin Krows. Cloth covers, size 5x7½, numerous illustrations. Price **$2.00**
245 pages. Price ..... This volume is chuck full of easily-understood descriptions of the numerous processes that go to make up the working formula luminous to making "talkies."

THE ART OF SOUND PICTURES, by W. Pitkin and W. Marston. Cloth covers, size 5½x8, 327 pages, 15 illustrations. Price **$2.50**
The first book to give definite and practical advice on how to write for the talkies. Indispensable for writers who hope to make money by writing for talking pictures.

PHYSICS

FOUNDATIONS OF THE UNIVERSE, by M. Luckiesh. Cloth covers, size 5¾x8¾, 238 pages, diagrams and tables. Price **$3.00**
A popular treatment of physical science which tells entertainingly and without recourse to mathematics, how man has utilized to his own advantage the great primary laws he has discovered.

THE NATURE OF THE PHYSICAL WORLD, by A. S. Eddington. Cloth covers, size 5¾x8, 353 pages, charts. Price **$3.75**
One of the most fascinating books dealing with the complex problems of physics, philosophy, etc., that has appeared. Thoroughly important and thought-provoking.

THE MYSTERIOUS UNIVERSE, by Sir James Jeans. Cloth covers, size 5½x9, 190 pages, 2 plates. Price **$1.00**
An illuminating treatise which ranges from Newton to Einstein. A noteworthy book which promises a new era in scientific thinking. Cannot be ignored if you wish to be in touch with modern thought.

THE EINSTEIN THEORY, by Samuel R. Guggenheimer. Cloth covers, size 5¾x7½, 200 pages, illustrated. Price **$2.50**
A simple treatment of the Einstein theory with a minimum of mathematics. Sheds an illuminating light on a much discussed and misunderstood theory.

THE UNIVERSE, by Frank [illegible]. Cloth covers, size 5¾x7½, 148 pages, 31 illustrations. Price **$2.00**
The Theory of Relativity explained absorbingly and fascinatingly with an adventurous flavor, and with the least possible technicalities. Sound science, skilfully presented. The perfect book on relativity for the layman.

SEXOLOGY

THE SEXUAL SIDE OF MARRIAGE, by M. J. Exner, M.D. Cloth covers, size 5½x8, 253 pages, illustrated. Price. **$2.50**
An understandable book free from sentiment or hypocrisy, for those who seek marriage at its best. Deals frankly with intimate marriage relationships, especially at crucial points where ignorance and misinformation are often disastrous.

THE BANKRUPTCY OF MARRIAGE, by V. F. Calverton. Cloth covers, size 5½x8, 292 pages, illustrated. Price. **$3.00**
An attack on the prevailing stupidities with which most people treat sex, and why ignorance has reduced us to our present moral chaos. The necessity for change in our ideas of love, marriage and sex life made clear.

COMPLETE BOOK OF SEX KNOWLEDGE, by Dr. Bernard Bernard. Cloth covers, size 7½x9, 331 pages. Price **$2.75**
At last here is the book which dispenses with conventionalism in the discussion in detail of the whole sex problem. Not a single side of the sex question that has not been fully treated.

SEX CONDUCT IN MARRIAGE, by Dr. Bernard Bernard. Cloth covers, 7½x9½, 218 pages. Price **$1.75**
Answers simply and directly intimate questions which the author has been called upon innumerable times to answer. A sound understanding of sex conduct in marriage by simple, straight-forward explanations. A most valuable book.

WOMEN, HER SEX AND LOVE LIFE, by Dr. William J. Robinson. Cloth covers, size 5¾x8¾, 411 pages, numerous anatomical illustrations. Price.. **$3.00**
A real book dealing with intimate relations of woman's sex and love life. Full of practical information of vital importance to every woman, and through her to every man.

ZOOLOGY

INSECT STORIES, by Vernon Kellogg. Cloth covers, size 5x7½, 296 pages. Price... **$2.00**
A delightful book which takes you to the insects' haunts. Tells how they live and what they do. Written in story-like form.

LIFE OF THE WHITE ANT, by Maurice Maeterlinck. Cloth covers, size 5½x7½, 330 pages. **$2.50**
Price .....
A fascinating history of the life of an amazing insect—the white ant. The famous author relates many strange, unknown and curious facts about those odd little creatures.

SCIENCE PUBLICATIONS 94W PARK PLACE NEW YORK, N. Y.

We can get ANY book in Science or Mechanics, Radio, etc. Just furnish us with Title and Author or tell us in which topic you are interested.

EDITORIAL PAGE

DECEMBER, 1932

Volume 4 Number 7

WONDER Stories

HUGO GERNSBACK
Editor-in-Chief

DAVID LASSER, Managing Editor
FRANK R. PAUL, Art Editor
C. P. MASON, Associate Editor

WONDERS OF THE UNIVERSE

An Editorial by Hugo Gernsback

● When the average man picks up a newspaper or a scientific publication nowadays he is sure to find in it the latest theory about the universe. So much has been published lately, and so much confusion exists on the subject, that it is difficult for the man in the street to follow the trend of thought in this direction intelligently.

Indeed, I am often asked what I mean when I use the phrase "our universe." The answer, in a few words, is that *our* universe comprises, not alone our entire solar system made up of our sun and the various planets, but also several million other suns, called stars, which we see in the Milky Way. Indeed, the Milky Way is the definition given to the expression "our universe." In other words, we are part of the Milky Way or Galaxy; which is now thought to be a sort of lentil-shaped agglomeration of millions of stars. And furthermore our own planetary system is not in the center of this universe, but somewhere on the side.

The modern astronomers have good reasons to believe that the Milky Way, tremendous as it is, is only one of millions of similar stellar "galaxies." The Milky Way is supposed to have a diameter of some 300,000 light years; or expressed in miles, this would mean a diameter of 1,800,000,000,000,000,000 miles, almost 2 quintillion miles. A tremendous distance, you may say, but still insignificant when it is compared with the larger "cosmos." Our own universe in comparison to the whole cosmos is like a single large pebble lying on the beach. The millions of other pebbles scattered over the shores of our whole globe represent other universes.

And when it comes to the distances between our universe and others, even the nearby ones, it is hardly possible to express them in miles because the distances are too vast to be comprehended by the human mind.

And wonderful as all this may be, there are greater wonders; because we know today that none of these universes are at rest. *They are all in motion*, going somewhere in space, their ultimate destination unknown. Nor is much known about the speeds at which our various universes move. Recent observations made seem to prove that some of these distant universes (called nebulas) are running away from us at the inconceivable speed of 12,000 miles a second. These apparent speeds, so far, are the greatest observed velocities of material bodies known to science.

But scientists themselves are not too sure that these speeds are real; only the future may tell us more about this. In the meanwhile, one set of astrophysicists are of the opinion that our entire cosmos is expanding—exploding, as some put it—as if each one of our universes were a particle of gas rushing away from a central explosion—with the difference that the explosion is continuous, never stopping.

On earth, if you have an explosion it is limited by gravitation; that is, the earth's attraction tends to bring the exploded particles back in due time to the surface of the earth. Not so with our out-rushing and scattering universes. There being no central gravitation—at least we know of none—once a universe is set into motion it keeps on going with ever-increasing speed. And, space being of unimaginable extent, there is little chance of a collision between the universes. Probably not once in a billion times is there a collision. Nor do we know what force makes the universes speed on in space; whether there is a universal force of attraction or gravitation; whether there is a gravitational attraction between the various universes; whether it is the pressure of light that drives on the universes; whether the cosmic rays have something to do with it,—no one really knows anything about it. As a matter of fact, one theory today is as plausible as another.

The subject is so vast, and our knowledge is so primitive and childlike, that it will be thousands of years before anything worthwhile knowing about this fascinating subject will have been disclosed. Only future astronomers can say, with certitude, that the major points of knowledge about our universe have been determined.

THE ASSOCIATE SCIENCE EDITORS OF WONDER STORIES

are nationally-known educators who pass upon the scientific principles of all stories.

ASTRONOMY
Dr. Clyde Fisher, Ph.D., LL.D.
Curator, The American Museum of Natural History.
Professor William J. Luyten, Ph.D.
University of Minnesota.

ASTROPHYSICS
Donald H. Menzel, Ph.D.
Harvard College Observatory.

AVIATION
Lt. Col. William A. Bevan, B.S., M.S., M.E.
Air Corps Reserve, Professor Aeronautical Engineering, Iowa State College.
Professor Earl D. Hay, B.S., M.S., M.E.
Head Department Mechanical and Industrial Engineering and Professor of Aeronautics, University of Kansas.
Professor George J. Higgins, B.S., Aero. Eng.
Associate Professor Aeronautical Engineering, University of Detroit.
Professor Felix W. Pawlowski, M. & E.E., M.S.
Department of Aeronautical Engineering, University of Michigan.

Professor John E. Younger, B.S., M.S., Ph.D.
Department Mechanical Engineering, University of California.

BOTANY
Professor Elmer G. Campbell.
Transylvania College.
Professor Margaret Clay Ferguson, Ph.D.
Wellesley College.
Professor C. E. Owens.
Oregon Agricultural College.

CHEMISTRY
Professor Gerald Wendt.
Editor, Chemical Reviews.

ELECTRICITY
Professor F. E. Austin.
Formerly of Dartmouth College.

ENTOMOLOGY
William M. Wheeler.
Dean, Bussey Institution for Research in Applied Biology, Harvard University.

MATHEMATICS
Professor Waldo A. Tilsworth, S.M.
Alfred University.

MEDICINE
Dr. David H. Keller.
Pennhurst State School.

PHYSICS AND RADIO
Lee deForest, Ph.D., D.Sc.

PHYSICS
Professor A. L. Fitch.
University of Maine.

PSYCHOLOGY
Dr. Marjorie E. Babcock.
Acting Director, Psychological Clinic, University of Hawaii.

ZOOLOGY
Dr. Joseph G. Yoshioka.
Yale University.

Editorial and Advertising Offices: 96-98 Park Place, New York City

(Illustration by Paul)

We stared aghast at the fast disappearing figure rising toward the Martian landscape that stretched so menacingly above us.

THE WRECK OF THE ASTEROID

By LAURENCE MANNING

● Space voyaging! How thrilling it sounds and yet how unbelievably monotonous it is in fact! We all of us spent ecstatic hours at first before the periscope glass; not one of us but felt the thrill of that star-studded sky. But after two or three days a man gets used to anything, and after as many months . . . !

The unmeasured minutes and hours and days passed by in such slow routine that I came to doubt whether this existence would ever cease; whether brisk stirring adventures could lie at the end of our monotonous imprisonment.

When such a feeling came upon me I would go to the screen and gaze out upon the bejewelled vastness reflected there, or stare wonderingly back at the little sliver of light edging a circle of blackness that was all now visible of the earth and her teeming millions.

Kings in pompous palaces and humble citizens in cottages—all occupied with eating and sleeping and doing the thousand and one unimportant things that form the detail of life back there on earth. Then I would feel the blood stirring once more in my veins and I would sigh longingly for the end of our voyage and the commencement of the active part of our expedition.

There is one thing to be said for space voyaging, however: It gives one a completely new sense of values. You who think it such a vast distance from the Pacific to the Atlantic, come stand with me before a glass screen and put your forefinger down on that little twisted mark you are pleased to call "North America" and observe how your finger covers it completely from sight! Then reflect with me that down there are little microcosms (just like ourselves) who take twenty-four hours to cross that "continent" in the fastest airplane. I tell you, it is a fine cure for self-importance!

So I reflected as I lay on my cot in the rebuilt *Asteroid* speeding through space to Mars. Life at that moment appeared to be a very uncertain proposition. Six months ago, just settling down to a quiet and comfortable life, I would have little credited a prophecy of my present situation. Yet it came about with the greatest simplicity. The fact is, the world will not permit any man to rest upon past honors and accomplishments. Worse than that, neither will his friends!"

Upon the return of Haworth, Mason and myself from the memorable voyage through space to Venus* we had determined that a further exploration of that planet must some day be attempted. After six months in the security and comfort of civilization, Haworth was impatient to start work on a new rocket ship, and, although I could have very well supported the "tedium" of another year's existence in my comfortable niche, I would not be the one to confess it. I had, however, such an extreme unreasoning horror of the steamy fog-blinded jungles and swamps of the sunward planet that I could muster very little enthusiasm for a return voyage.

Then Mason had returned from a month's visit at the Mount Wilson observatory where he had been studying the planets in the new 200-inch telescope. He brought us some very interesting news: that the "canals" on Mars were at a considerable depth below the surface of that planet. The careful measurements he had made, indicated well over a mile, and more than that, no doubt, in special places. This put a new light on the matter of our voyage, for if only one could get three miles or so below the surface of Mars the air should prove dense enough to support life. The atmosphere seems to contain a sufficient proportion of oxygen and there are apparently no noxious gases, according to spectroanalysis.

A voyage to Mars! The first men in history to set foot on all three of the habitable planets in the solar system! That was something to thrill about, and by the time our plans were complete and the ship ready to start we were as excited over the prospect of our voyage as can well be imagined. We took along three additional members in

*"The Voyage of the Asteroid" Summer 1932 Wonder Stories Quarterly.

● Mr. Manning is evidently trying to prove that realism in science fiction can be more exciting than simple fantasy. In his story of a realistic journey to Venus, "The Voyage of the Asteroid" published in the last issue, he stated no theories about that planet that could not be backed up by scientific reasoning. Yet, on the reports of our readers, the story was vivid and thrilling.

In the opinion of the editors, the sequel is far superior to the original. Now Mr. Manning turns his clever and imaginative eyes to Mars, where we have a gripping drama of a few men fighting against death on a dying world. Think of being stranded on Mars, faced with every imaginable kind of enemy. What can the ingenuity of man conceive to effect a rescue? Will he weakly resign himself to his fate, eventual death, or will he fight for life with all the weapons at his command? The author's answer is one that every explorer will echo.

our crew—Bill Perkins, Haworth's mechanic who was largely responsible for the building of the first *Asteroid;* Teddy Colquist, explorer and athlete; and Jack Craig, a chemist and geologist.

We had been traveling almost three months and soon expected to land our vessel on Phobos, Mars' inner moon. This tiny world is about six miles across, and its orbit is about three thousand miles from the surface of Mars. Why should we land on Phobos instead of upon Mars itself? For two reasons. First, our living conditions upon Mars depended upon our finding a valley very much larger than ordinary—at least three miles below the surface. Such accurate observation could not be made from earth and we dared not leave such an important thing to a chance discovery from the ships as we approached our goal. By landing on Phobos we could spend several days studying Mars at close range, pick out our deepest valley and then start off for it. In the event that no really deep spot could be located, we need not venture down at all, but could simply spend a few weeks in study and then return to earth.

The second reason was even more important. Upon Mason's announcement of the results of his astronomical work at Mount Wilson, Haworth had frowned violently and shook his head till his beard wagged.

"Such a trip would be nearly impossible," he had said. "In a five thousand ton vessel we can visit Venus, but to reach Mars and return would require nearer forty thousand tons. Where would we get the money?"

"But what's the difference?" I had expostulated.

"We landed on Venus by gliding without power. We couldn't do that on Mars, with its very much thinner atmosphere."

Mason nodded his head soberly and explained the matter to me:

"The *Asteroid's* last step weighs only eighty tons—a complete little ship in itself. She can carry enough fuel to take her off into space at a total speed of five miles a second. But that is not enough—we need seven miles a second to leave the earth. In going to Venus, we landed without extra power, but required another seven miles a second to leave that planet. The landing on earth was also without power, making a total of fourteen miles a second velocity for the whole trip, with a little extra for steering.

"Now consider the last step of the *Asteroid* carefully. Of the eighty tons total weight, only ten are used in 'pay-load'—cabin, crew and supplies. In other words, the ship weighs eight times her actual cargo. Now to increase our speed beyond five miles a second we consider the whole last step of 80 tons 'pay-load' and put it in the nose of a larger 640 ton second 'step' (eight times as large, you see). There is the principle on which we work. To reach fourteen miles a second we will need three steps—the first is 80 tons, the second is 640 tons and the third a little more than 5000 tons.

"So much for a trip to Venus. But coming to Mars, we cannot land safely except by turning the ship end for end and applying power to reduce our velocity as we fall. It uses as much fuel to lose speed as it does to gain it, so this operation will require a fourth step in our construction. This will be, of course, eight times the previous total of 5000 tons."

"Forty thousand tons!"

● It was clear to me now, but I kept puzzling about the seeming paradox: eight times as much power to land on Mars as it took to make all the rest of the trip! Haworth was thinking deeply!

"It has been proposed by several men of science that a rocket ship might take along a small 'tender'. The main vessel is left circling the planet while the small one visits the land below and returns. Something of this sort might be possible here, it seems to me."

Mason clutched his hair with both hands. Then he snatched pencil and paper and scratched figures for a minute. Finally he threw the writing materials into the air and sprang to his feet, madly excited.

"Phobos! It's solved. Why didn't I think of her before?"

And thus originated the plan which enabled us to make the voyage to Mars. It was a clever and shrewd piece of reasoning the final testing of which would soon, now, come to pass. We were 86 days out from the earth and nearing the end of our voyage. Mars loomed huge in the periscope screens. I looked about the cabin. Mason was busy collating astronomical notes at a little table fitted snugly between two girders in the hull. Haworth and Bill Perkins were somewhere up in the machinery, checking a refractory pump in one of the refrigerator units. Teddy and Jack were leaning over the periscope glass absorbed in contemplation of the planet reflected there.

Dear lads! As I write these lines I realize all over again that I grow older each year. The days that are past can never come again. What a fine boy was Teddy Colquist, with his open face and bright gray eyes set in sunburn—slim and graceful body trained to the keenness of a whiplash. And great, kind, lumbering Jack Craig—as gentle as he was strong.

As I lay there thinking and dreaming, Mason started up from his notes with an exclamation, rushed to the periscope glass (Teddy and Jack standing aside) and measured something with a pair of compasses. His words electrified us all:

"We are gaining speed. We have commenced to fall rapidly toward Mars and if my figures are correct we'll be there in three days."

"How is our course?"

"Off direction almost ten minutes of arc, but it will make no difference now."

The next two days were spent excitedly at the observation glass in the living cabin. The great disc of Mars was in full sunlight and I had to be active with my camera. I made a complete mosaic map once each day (more difficult than it may sound, for Mars spun slowly on its axis and our distance was constantly lessening, so that it was necessary to make elaborate preparations and then work with great speed to finish the exposures in as few minutes as possible).

But what a Mars it was! Plainly before us lay the broad valleys (misnamed "canals" a century ago by a careless translator). We were nearest the Northern hemisphere and the polar ice-cap was still large and glistening white, although the Martian spring could not be far off. Radiating in a hodge-podge of lengths and directions the brown lines extended—quite evidently of considerable

width and (some of them) hundreds and even thousands of miles in length.

Large areas were without such markings and these spots showed reddish. "Sand," I said to myself as I looked at them, and thought of the dreariness of such a world. Was it, *could* it be, purely chance that had so criss-crossed an otherwise desert planet with a system of deep, broad valleys connecting at both poles with the great frozen water reservoirs? Could such an intelligent result be reached haphazardly by blind, unaided Nature?

Stare and puzzle as we might, we were still too far away to solve the mysteries of the planet. Early in the 89th day of our voyage Haworth reversed the *Asteroid*, so that we fell end to, and he applied the power to retard our speed.

"We must approach the inner moon of Mars with little more than a third of a mile per second total velocity, relative to Mars. I plan to reduce to a half mile per second by the time we are five thousand miles away from the planet. That leaves us just enough room for navigating."

"Keep a sharp lookout for Phobos!"

Haworth nodded and turned the power lever up another notch. After a minute he frowned thoughtfully.

"Where is Phobos now?"

"Shut off power again and we'll see. She must be near by."

● He pulled back the lever and Mason swung the periscope controls questingly.

"There!" I could not refrain from shouting, as I saw the tiny moon swing into view in the glass over his shoulder.

"Couldn't be better! We're almost exactly following the little chap. About fifteen degrees right ascension and ten minutes north of our present course . . . let's see . . . There, Haworth! Give her a few seconds of power on that objective."

Slowly the half dark disc in the glass loomed larger until we could seem to reach out and touch it. It filled the whole screen, moving slower and slower. There was a breathless five minutes during which hardly any motion was to be seen at all, but it ended finally in a slight bump as the ship touched the surface of the moon Phobos. We had landed the *Asteroid*.

Bear with me a minute: You determine upon a voyage; build a ship and enter her, sealing the door after you. So far there are no thrills except those of anticipation. Then you turn on the power and after eight or ten minutes of acceleration shut it off again. You are in a completely enclosed cabin: (as the *Asteroid* is designed, at least) you look out of a telescope, that is all. Month after month in your cramped prison, and the fine thrill you set off with has dimmed to sheer boredom.

But finally at the end of your voyage there comes the time when you stand in front of a closed door and realize that by turning a handle you can step onto the surface of a new and unexplored planet—an outlandish and unimaginable scene will stretch before your eyes. That moment is your reward for months or years of work and privation. But it is worth it!

Nothing else in life can equal that thrill. The blood pounds in your ears and your breath comes quickly and your senses sharpen to the brisk aroma of high adventure.

We all six climbed into our space suits and adjusted our oxygen helmets and stood in front of the airlock ready to set foot on Phobos. Haworth waved Mason and myself in first and crowded after us, leaving the other three to take second turn. The outer door swung aside to reveal the blazing brightness of sunlight in space. It blinded us completely for a full minute and then we could make out the smooth roundness of the little globe before us. Here and there small prominences cast unbelievably black shadows; cracks and furrows of minute proportions ran in all directions over the surface, which was light gray in color. We shut the door behind us and climbed down to the ground where we were joined in a few minutes by Jack and Bill and Teddy.

LAURENCE MANNING

Exploration in a space suit is an adventure in a class by itself. There was of course no atmosphere at all. We were therefore confined inside our oxygen helmets, each of which had a window, through which we saw the outer world, and a small telephone head-set. A cable from this latter could be plugged into the helmet of any one of our companions, but we had no use for speech—nor any sense save that of sight. Mason's rubber-clad arm pointed silently upward and we all craned our necks. There about three thousand miles *above* us was the immense Martian landscape spread clearly to view. Considerable minor detail was to be observed, though much less than we had seen in the periscope glass from inside the ship.

Haworth turned and plugged his cable into my helmet.

"Better get inside. The *Asteroid's* telescope magnifies a hundred diameters and will be more use than this rubber-necking."

So we all returned to the ship, though Jack and Teddy, waiting for their turn at the airlock, did not fail to test Mason's prophecy that "a full-grown man would weigh less than an ounce on Phobos."

Some of their leaps were startling to see and as the door shut I caught a glimpse of Jack's great body making a flying horizontal jump of more than fifty feet! They joined us inside, however, without delay. We stripped off our space-suits, laughing and chattering like schoolboys. Our real adventures were starting at last and we were all profoundly happy about it.

In the glass we found it quite possible to measure with some accuracy the shadows cast by the sides of the Martian valleys. Seeing conditions were almost perfect, for the landscape above us turned obligingly to present fresh territory constantly to view. I had a large scale map sketched out on a roll of paper from my photographic notes and any particularly deep channels or areas were carefully marked. This work required some time, for

while Phobos circles Mars in less than eight hours, we wished to be sure of our facts and spent two whole days mapping and measuring and rechecking our work.

We assumed at first that our destination would be Solis Lacus—the "dark eye" in the Southern hemisphere visible from the earth. But deep as this shadow proved, we found a deeper one still in the Northern hemisphere. A "canal" running from the Polar ice-cap south some hundreds of miles showed a very heavy shadow, indicating great depth—considerably more than a mile. This in itself would be quite insufficient, but at its southern extremity there was a small depression, more than twice as deep. It was circular and about ten miles in width, as we judged. There could be no question that this was the deepest valley we had seen and subsequent observation only confirmed our first opinion.

Mason straightened himself and looked around at us with raised eyebrows.

"That's that! Now we may as well get ready for the trip down."

Haworth frowned. "And here, then, comes the parting of the ways."

We all looked inquiringly at him.

"Someone must stay with the *Asteroid*. We may be gone several weeks. The machinery must be kept in good order and properly working all the time. It's too risky to leave it alone."

There was an awkward moment. Which of us would be left behind?

CHAPTER II

A Sudden Start

● Teddy glanced sidewise at Jack and licked his lips, as though they had suddenly gone dry. Mason stood staring at the wall blankly, one eyebrow raised. Bill scratched his head, staring the while at his feet.

"We might draw lots."

Haworth shook his head. "I need Bigelow and Craig for observational work. I need Mason for navigating and Colquist for general emergencies."

Bill looked up slowly, while the rest of us drew breaths of relief.

He nodded quietly. "You're right, Mr. Haworth. I should stay with the machinery. It's not what I hoped, but after all I'm the one member of the crew you hadn't planned for. It's only fair."

Poor old Bill! I had, in a way, been responsible for his coming on this expedition in the first place, for only five members of the crew had originally been planned. I had come upon him one day, just as the building of the *Asteroid* was being completed, eyeing the rocket ship with the most wistful air I have ever seen in a human being. As I approached he was heaving a tremendous sigh.

"Well, Bill, we'll be off again soon now. I'm getting as excited as a schoolboy. It seems strange to think of a world full of people who are going to remain here. Don't you wish you were coming along?"

He swallowed hard, then gave a wry smile and answered: "Some has to go and some stay home, sir. 'Tisn't everyone can do what he wants . . . . but I *built* the ship, anyway . . . . I did that!"

"Why Bill! You wouldn't leave your family and join us?"

"No? Just try me once!"

The others were enthusiastic when I mentioned the incident. "Good old Bill!" exclaimed Haworth. "Of course he shall come along!" and we all set out in a body to inform him of his good fortune. It was rather embarassing as it turned out, for he burst into tears, which he dashed away with his big work-roughened fist.

"It's just the unexpectedness of it, Mr. Haworth," he had explained. "There isn't anything I'd sooner do, now any place I'd sooner go nor any folks I'd sooner go with in the whole blooming creation!"

And now, I thought to myself, after all Bill will be a mere looker-on as the rest of us set foot on Mars. True, he had made the trip with us and would be the only human observer of the "discovery" of the new world. He would see it all from a grandstand seat, as it were, but I felt badly about him just the same. So did my companions. We all crowded around him and patted his back and told him how sorry we were and how sporting he was about it.

"You can watch us through the telescope, Bill, every time this little moon passes over our valley. You could even signal to us with the ship's floodlights. I think we could see them. And you will be able to see us plainly enough through the telescope and read our signals."

"Do you know the Morse code?" asked Mason.

Bill nodded. "Fairly well, Dr. Mason. I can read as fast as you'll be able to send with a sheet or whatever you're going to use."

"Oh, we can send quite fast. We can use a mirror and rig up a heliograph to reflect the sun at you."

The next job was to free the rocket tender from the *Asteroid*. We all donned space suits and gathered outside at the rear of our ship. Phobos seemed to present always the same face to Mars and we had landed the *Asteroid* just inside of the edge of the area that would be visible from the planet. It followed, therefore, that we were in darkness part of the time that Mars was in sunlight. The great shining landscape provided as much light as an earthly twilight. As we commenced our task the sun had set on our section of Phobos, and this fact rendered working conditions much more comfortable than they would otherwise have been.

The ten-ton tender was fastened to the rear of the *Asteroid* like a tail and we had only to unscrew twelve massive aluminum bolts. This was the work of five minutes and four of us then stood beneath her to hold her up as she came away. On this tiny world her ten-ton weight amounted to less than ten pounds! We bore her triumphantly to one side and rested her on the ground. Haworth plugged in his cable and ordered me inside.

"You can be gathering our equipment together and placing it in the airlock. I'll send Teddy in to help you. The rest of us will stow it in the tender's cabin."

We had a simple task, for a month ago we had segregated the material we would need. Half an hour saw it all outside and Teddy and I followed. The rocket-tender had a tiny vestibule airlock, just capable of holding one man comfortably at a time. Inside was her cabin—ten feet wide and twenty-five in length. It was cylindrical in shape and a small periscope glass gave vision on outside space. Five hanging bunks provided for the crew and

the instruments and controls were much the same as in the larger *Asteroid*. We stowed our duffel in lockers which covered all the walls and got everything shipshape.

"What will we call her?"

"If the big ship is the *Asteroid*," remarked Mason, "surely this should be named the *Planetoid*."

"That calls for a drink!" cried Teddy.

And we all trooped into the cabin of the *Asteroid* where we had our meal and a small glass of rum apiece in honor of the christening and the success of our voyage so far. After we had finished, Mason spent a few minutes at the periscope glass and did some figuring on a sheet of paper.

"We cannot start up to Mars for another two hours," he announced.

"Two hours!" exclaimed Teddy, as though it were an eternity. "Well, I suppose we can explore Phobos in that time. Let's do it, Jack."

"All right," agreed Haworth. "In the meantime, we'll make all preparations and when you return you can get right aboard the *Planetoid*, for we'll be ready to start. Don't be late!"

They were soon in their space suits and I felt the urge to join them. Haworth, Mason and Bill remained behind. behind.

● We started over the curiously roughened (but level) surface. My weight could not have been more than a few ounces at most. It was tremendously exhilarating to take vigorous bounding strides at the mere touch of a toe. In fifteen minutes the glaring sun came into view, for we had entered the "day" side of Phobos. I felt we had come miles already, yet still before us stretched the curving surface, without the slightest variation of contour or texture. I glanced back over my shoulder and to my surprise found that the *Asteroid* was no longer in sight. I signalled the attention of my companions and, plugging in our telephone cables, we discussed the phenomenon.

"I think we had better return at once," said I. "On this small globe, without landmarks of any kind, we can easily become lost and might cause unnecessary trouble and expenditure of fuel to the expedition if we had to be searched for."

"All right," replied Jack. "And besides, there seems to be nothing to see anyway."

So we started back, as we thought.

After ten minutes of walking we still had no glimpse of the space ship and stopped for another conference.

"It's ridiculous," said Teddy, "but how the deuce can we tell where we're headin' without anythin' to go by?"

"If we could only find a small hill to look around from . . . . "

Jack gave a leap into the air—perhaps twenty feet—and landed asprawl. He shook his head grotesquely in its metal helmet. Then Teddy, comprehending, imitated his example, but also without result.

Then, as I watched amusedly, the two crouched and sprang in unison. Up they went—and up. Teddy's more athletic body gave him the advantage and he was still rising slowly as Jack started to fall back.

He kept on rising.

Now he must have been fifty feet up—now seventy-five.

And before my horrified gaze he continued to ascend, waving his arms and legs frantically and in utter impotence!

Jack landed in a heap at my feet and I helped him up. We both stared aghast at Teddy's fast disappearing figure, rising toward the Martian landscape that stretched so still and menacing above us. Then Jack pulled hurriedly at my arm and pointed toward the right. He commenced running and I followed, gathering from his gestures that he had been able to see the ship and was making toward it.

Each stride was twenty feet or more as we raced desperately along and in a few minutes the two ships appeared over the rim of the tiny horizon of Phobos. Bill was standing outside on the surface in his space suit and we waved a hasty farewell and scrambled aboard the *Planetoid*—I know not how—and frantically tore off our helmets.

"Teddy's falling on to Mars!"

"He jumped too far and kept on falling up!"

Haworth stared at us briefly and leaped to the controls, while we clustered around the periscope glass. There was a slight sagging which bent my knees under me and we were off, Mason twisting and adjusting the periscope desperately under Jack's direction.

"There he is—see that little black dot?"

"Right! A little south, Haworth—just a few seconds . . . . there!"

The dot on the periscope glass screen grew larger and soon we could make out the figure of our companion in his grotesque dress, turning slowly end over end. We pursued him cautiously and spent full five minutes in coming up gently alongside him, close enough for Jack, who was appointed to the task, to throw him a rope from the vestibule. We inside the cabin could see nothing of the rescue, of course, but presently the inner vestibule door swung open and the two of them stripped off their coverings.

Teddy was red in the face with laughter!

"Never in all my life imagined anything so funny—now that it's all over! The queerest sensation to be falling *up!* It seemed that Phobos was leavin' me, rather than the other way about."

"Very humorous, I'm sure," cut in Haworth, "but you nearly cost me one of my crew—yourself! And the Lord knows whether starting half an hour before schedule will spoil our whole plan! However, don't let such thoughts as these interfere with your laughter!"

Colquist was instantly contrite.

"Sorry sir, but in a way it couldn't be helped . . . . and there's no use in cryin' about things."

"Come clean, Teddy," said Mason. "You were a scared boy and you know it."

"Oh, I was in a funk, all right. I thought I was 'washed out' until I saw the *Asteroid* following me. Now I suppose I shan't be able to say goodbye to Bill!"

"But," said Jack, "how could such a thing happen?"

"It's this tiny world, Jack, and its very small gravitational pull. We're only three thousand miles from Mars and she pulls at us very much harder than does Phobos, whose speed in its orbit alone keeps it from falling into the huge planet. Teddy jumped toward Mars with just enough force to break the balance of forces and he kept on going. I should have warned you all before you start-

ed, but of course I never thought you were on an acrobatic tour of Phobos!"

"Every man to his post!"

Haworth's crisp command startled us and we rushed to obey.

"We are falling on to Mars. Mason, take the periscope! Jack, see that the landing wings are protruded! Teddy, are you ready on the duplicate controls? Contact!"

And he pulled back the power lever.

I lay quietly in my cot watching the others. The pressure of deceleration became greater and greater. I could see occasionally over Mason's shoulder the surface of Mars in the glass screen. The minutes went breathlessly by and presently I climbed down from my cot and poured out tumblers of rum for us all. Then another period of waiting. Now and again Haworth turned on the power briefly, but most of the time we were free-falling—near the last at least. The glass showed Mars enormous below us.

Then Haworth nodded and Teddy turned a wheel, which operated a gyroscope to turn the ship end for end once more.

"We are in the atmosphere and gliding around the planet until we come to our valley!"

"But it will be too thin to support us, Haworth! We have been compelled to start half an hour too soon and must traverse many extra miles."

"We must do the best we can. Just before we touch ground I shall use the retarding power once more."

It was an anxious moment. I leaned over to consult with Mason as to the location of our particular landing spot. The deserts and channels were slipping by beneath us at a great rate and here and there a low rocky mountain range was visible. I say "mountain range," but none that we saw were mountains in the sense we use that word on earth. They were rather hills, and none too large at that, but still sufficient to make us keep well above them. We were getting very close now, and it was necessary to turn on the power once or twice to give us additional speed, enough to remain in the air until our valley came into view.

"More power than we can afford, I'm afraid!" I could hear Haworth mutter.

"At last! See that junction of three channels—it's not far beyond."

"Thank God! I can't keep her up much longer!"

Down we swooped and Haworth checked her heavily, giving us all a sickening lurch as he did so. Then the particular valley we sought was just before us; it seemed that we would make a perfect landing, in spite of our much flattened angle of approach. I breathed a sigh of relief.

But just as we swept over the lip of the precipice that walled in the deep valley below us and just as Haworth had started to turn on the retarding power for the final maneuver, there was a violent lurch of the whole ship. I saw the sweat start on Haworth's forehead and Teddy's face full of alarm, as he raised it hastily from above the controls.

In a second there was another lurch and a grinding scrape that made the whole ship shudder from stem to stern. Then an immense crash and blow and I felt the supports of the cot suddenly drop away as a blinding light burst on my brain. The light grew to unbearable brilliance and exploded soundlessly. Everything became black. Thought ceased.

● A voice was speaking from a vast distance.

"Bigelow!"

I knew that name, I thought, and I struggled mentally to place it. I had heard it before many times . . . now where?

"Bigelow, old chap!"

Why of course! It was my own name. This struck me as somehow very absurd. But where was I? There was a buzzing in my ears and my head swam dizzily. Then the voice grew nearer until it was right beside me. I opened my eyes. Haworth stood there, an electric torch in his hand and a worried expression on his face.

"What's the matter?" I asked weakly and struggled into a sitting posture. Then it all came back to memory in a flood. We were wrecked on Mars! I was lying on the floor of the tiny cabin against the side of the locker casings.

"Are you all right, Bigelow, old man?"

"I believe I am. Got a terrific lump on my head somehow or other, though."

I felt my limbs cautiously, but finding nothing broken rose to my feet and felt considerably better than I had deemed possible a minute before.

"How are the others?"

"Teddy is pretty badly hurt; still unconscious. Mason is all right, except for a wrenched arm and Jack seems not to have had a scratch."

"Where are they? Are the lights not working?"

"No. We smashed rather badly, I fear. Jack is up in the pump room trying to find out what's wrong. Mason has put on his space suit and is outside looking things over."

I found myself breathing rather hard. A thought struck me full of alarm.

"Haworth! *How is our oxygen?*"

He shrugged his shoulders hopelessly.

"The whole hull is cracked and our atmosphere cannot last more than half an hour more."

"Are you sure?"

"Not quite, but anyway we'll find some way out if we can. In the meantime, you'd better tend Teddy if you feel up to it."

There were plenty of electric torches and, Haworth handing me one, we both went over to the far corner where Teddy lay motionless. Jack came through from the next cabin and was delighted to see me up and around, but his news was discouraging.

"The whole apparatus is done for, Mr. Haworth! Two tank supports are broken clean off and the plunger rods bent so far out of line they'd take a couple of days to fix. The oxygen tanks are cracked, too, and the stuff inside is boiling away by the minute. I'm afraid we're all through with the *Planetoid*."

Haworth went to see for himself and I turned my attention to reviving Teddy. As I feared, he had received a severe blow on the head which might or might not cause complications. A careful examination of his body revealed a broken femur, close to the knee. His left arm had been bent under him when he fell and had also been broken—both were, fortunately, simple fractures. But he was breathing quietly and I determined to utilize his pres-

ent unconsciousness to set and splint the broken bones, which I did with Jack's help. In the uncertain light I hoped for the best, for I could not be sure how truly the edges met. As we were finishing, Haworth returned.

"We will have to abandon ship."

"What shall we do, then?"

"Jack! Check over all the space suits and fill the oxygen helmets from the ship's reservoirs while there is still some left there. They are leaking badly. If you are through with Teddy for the time being, Bigelow, you and I must make a pile of such essentials as we can carry with us."

"But Haworth! Where can we go on this airless surface of Mars?"

"Why, where we were aiming for, of course! We are in the channel somewhere, certainly, for we were wrecked on the side of it. Perhaps we are not too far away from the deep part of the valley to make it walking."

As he spoke, the vestibule door opened and Mason entered, pulling off his helmet hurriedly.

"Ship's hopeless, Haworth! There's a great dent in her hull and several cracks showing outside."

"Where are we?"

"About three miles up the valley from the deep hole we were aiming for."

Mason noticed me for the first time.

"Hurrah! Nothing wrong with you after all, Bigelow? Why, that makes us all here now except Teddy! How is he?"

I reported his condition. "If we are going to try to walk any three miles, don't forget that someone will have to carry him," I added.

Haworth nodded thoughtfully.

"Bigelow and I were just starting to get things together, Mason. Jack is checking over space suits and oxygen helmets. No use trying the atmosphere outside without a helmet, I suppose?"

"None. There's oxygen in it, of course, but it's much too rare to breathe—except just possibly for a few minutes. If we could descend about a mile we could manage nicely, but not here."

"Better hurry!" called Jack from the pump chamber. "The tanks are almost empty now. Is Dr. Mason back? I want to refill his helmet if we still can."

Then began our hurried exodus. We found we had to put on our space suits and helmets before we had finished collecting our loads. Jack, as the strongest, carried Teddy on his back, first throwing over one arm a coil of rope about two hundred feet long, very fine and strong. In his pocket he placed a thermometer and an aneroid barometer. Mason had a collapsible tent in which had been rolled twelve woolen blankets. He dragged this, for he found the load too awkward and heavy to carry, even on Mars with its greatly lessened gravity. I loaded myself with food of all kinds—mainly in cans. I filled two sacks and, tying the tops together, swung them pannier-like across my shoulders. I found that I could barely stagger along beneath the weight. Haworth took tools and things. He tied together two shovels, two pickaxes, a hatchet and a crowbar. This bundle he attached to his waist by a rope and dragged it after him. Around his neck he wreathed a heavy coil of copper tubing and in his arms he carried two boxes—Teddy's box of chemicals and a smaller box of mechanical odds and ends.

CHAPTER III

Stranded on Mars

● We helped each other out of the vestibule, which was at the top of the vessel—thirty feet above the ground—and we had to waste a precious five minutes lowering ourselves to the ground by a rope ladder. I plodded on in the wake of the others for several minutes and then turned to take a last look at the *Planetoid*. She lay on her side slightly buried in the sandy earth in which she had fallen, and about her the matted and dried vegetation of this Martian valley had been cleared away by the force of her impact.

"Farewell, brave ship!" I muttered into my helmet. With a sense of foreboding I sighed deeply beneath my burden and turned after my companions. Our feet were treading for the first time in human history upon this soil. All about us lay the unimaginable mysteries of Mars. Everything from the tiniest grain of dust to the strange brown foliage and the great stone ramparts that towered above us on each side—everything was unknown.

No sound came to my ears in their metal casing and my sight was limited to the glass window set in front. Had our circumstances been less distressing this window would have sufficed for a wealth of excited and eager observation, but I could not help wondering whether we were simply walking to our death.

While the suits were uncomfortable in many ways, the heavy rubber, of course, protected us excellently against extremes of cold and heat and would prove invaluable to an existence on Mars. About my waist was a belt filled with .32 cartridges (100 rounds) and at the left side hung a water bottle, while at the right were slung a hunting knife and a Colt automatic. Even without our terrific burdens we would have been uncomfortable enough! Fortunately the pull of gravity was materially less (about one-third) than it would have been on earth or else we should have been crushed beneath our loads. As it was we made tedious progress.

The ground was boulder strewn and carpeted with brown, dried vegetation. Here and there a clump of bushes or small trees occurred, but mainly the growth was low. The trailing vines had a way of catching one's feet and tripping one—indeed, Jack fell within the first ten minutes and the unconscious Teddy was thrown heavily from his shoulder, but landed in a thicket of shrubs which broke dustily under his weight. He was apparently not injured, but we slowed down our pace after the accident.

We were in a long valley some seven miles across. The ground sloped gently down before us and the huge grey precipices on each side seemed to vanish abruptly about two miles further on. This opening was our goal, but so slowly did we proceed that when a full hour had elapsed we had gone little more than half way. Our helmets were good for between two and three hours of breathing and this thought spurred us all to our utmost. We walked in dead silence, of course, for our helmets shut us in hermetically.

The last mile took less than forty minutes to cover and Mason (in the lead) stopped while we others, in single file, came up to him. We stood on one bank of what was plainly a dry watercourse. Before us it dropped away in a steep, boulder-strewn decline for three miles or so,

at the bottom of which lay a level valley, circular in shape and apparently about ten miles in diameter. It was covered with the same dry vegetation as our channel, but just below us were two large areas of bare red sand, dotted with queer-looking growths at sparse intervals. But we had no time for deliberate observation. Less than an hour of oxygen supply remained in our helmets. Haworth gave a signal and we held a telephone consultation.

"The only way down is by the watercourse. Mason and Bigelow can throw their bundles over the steep precipice to the right and we can pick them up afterwards. We will need extra hands to help carry Teddy and these breakables of mine.

"And your bundle of tools, Haworth?"

"They can be thrown down, too. We will tie them up in the blankets."

"But suppose when we get down there the air proves poisonous? We have had no time for a chemical analysis, you know!" (Thus Jack, our chemist.)

"We must leave something to chance. Besides, what else can we do?"

"We might as well die at the bottom as up here, Jack!"

We hurried some two hundred yards to the right where a landslide had left a steep cliff a mile deep down to a sloping mound of sand and rock below and there dropped our bundles. Then, without pause, we hastened back to the watercourse. Haworth had in the meantime gone down some two hundred yards and had been stopped by a sheer vertical drop beyond. By the time we reached him (Mason with one of Haworth's boxes and I helping Jack with Teddy's still unconscious body) he had fastened one end of the rope strongly to a projecting ledge and had descended to a foot-hold below.

We pulled up the rope, tied it carefully to Teddy's feet and waist and lowered him to Haworth's upraised hands. Then we followed down, myself last. I untied the rope and hung it over the ledge about mid-length, lowering myself by the double strand. When my feet touched bottom, we had only to pull one end and so recover the line.

Our tremendous exertions and the warm sunlight had us gasping, but on we pushed, desperately. One question hammered steadily in my brain, suggested by Jack's remark: "Can we breathe even when we get down there?"

Down and down that cruel slope, handling poor Teddy with exaggerated care, for the least mistake might spill us all. Minute after minute—obstacle after obstacle! Now my air tasted sickish and foul, but I dared not remove the helmet. Down a long glissade we slithered, gaining two hundred yards in a few minutes, only to have to use the rope to lower us over a fifty-foot cliff slowly and laboriously. My head was whirling round and round; my brain no longer took in the meaning of what I saw through the steam covered goggles. I felt faint.

"What is the use?" I said to myself. I lowered Teddy's feet to the ground and saw Jack twist about quickly to see what I was doing. But I could not go further. My lungs were full of foul air and I had reached the end of my capacity. Was this to be the end, or could we breathe this limpid atmosphere around us? I would find out!

● Quickly I raised my hands and gave my helmet the half-turn that released it. I held my breath and looked about me for a frantic, panic-stricken second. The air was delightfully cold on my sweat-soddened skin. With a bravery born of desperation I stood up straight on my legs and gasped in a huge lungful.

Then another! What air! It was crisply cold and as bracing as a swim in a mountain lake and as delicious as only air never before breathed by human lungs can be. I shouted to the others and waved my arms exultantly. Jack was by this time removing his helmet and breathing loudly and joyously. The others evidently had just noticed that we had fallen behind and I could see them stop, stare and hastily remove their helmets. Soon they too were enjoying the fresh pure atmosphere.

"Thank God!" called Haworth. We all shared his thankfulness. We were saved. The one element that man needs instantly every minute of his life and without which life (as we know it) would be utterly impossible was here and in sufficient abundance. We were new men now and drawing enormous hasty breaths. This, Mason pointed out, was proof that the air was still too thin for comfort.

"It feels about the same as at the foot of the pinnacle on Mont Blanc," said Haworth reminiscently. Jack produced the barometer and it registered 3.72 inches of mercury—one-tenth of the pressure at sea level on earth.*

We removed Teddy's helmet and chafed his hands and moistened his lips with water and soon had the pleasure of seeing his eyes open. Our stopping place was two-thirds of the way down the watercourse in a level spot, beyond which a more gentle slope led to the valley bottom below. In each man's pocket was an emergency biscuit ration and we munched this and sipped water and discussed our situation. Teddy was weak, but sane and very much interested indeed. When we had told him all that had befallen us since the wreck he looked about with wide-open eyes.

"So this valley below us is to be our future home! Even if we could scale these surrounding precipices, we wouldn't find enough air to keep us alive up on the surface—we can't even live back there in the main valley above where the *Planetoid* is lying. Well, let it be! But what a sportin' thing it'll be to explore every last inch of this valley below—to make our home there—to colonize. We'll set up factories and find iron and mine it and some day, perhaps, build a new *Planetoid* down there and return to poor old Bill."

Mason laughed.

"Give a nigger an inch and he'll take an ell. You evade death by a hair's breadth and instantly you demand all the comforts and resources of modern science!"

I gazed up at the clear blue sky. One fleecy cloud floated there, small and plump, but the moon Phobos was nowhere in sight. Haworth thought it best to spend a full hour in this spot, making a careful map of the valley and marking such places as seemed suitable for a permanent camp.

"We must have water, first of all," he said. "That is a rare commodity on Mars, but doubtless in this sunken valley we will find some remnant of last spring's freshet, at least sufficient to carry us along until the ice-cap melts in the north."

*With Mars' gravity only one third that of the earth, the density of the air was equivalent to a barometric reading of over 10 in earthly terms.

"Will this valley be flooded?"

"Perhaps—who knows? We must find a spot where we can dam up a good supply of water however it comes and yet build our camp on land high enough to be out of danger from possible floods."

"How long before the water arrives?"

"About a week or two," replied Mason. "That's my guess, at least. We used to observe in our telescopes from the earth how these long valleys became green when the polar ice-cap melted away but, of course, whether the water comes slowly or with a rush we cannot tell until we see for ourselves."

"But in the meantime we must have water," repeated Haworth, "and that is the first and by far the most important thing to be done."

Out in the center of the circular valley rose the peak of a small mountain. It showed conical through the surrounding foliage, which screened almost all the ground from our view, and terminated in a flat top. About two hundred yards to the left of this hill appeared a section of the dry watercourse shining whitely through the brown and lifeless trees. We all agreed that somewhere near this might prove to be our best permanent location.

"And before we do anything else," put in Mason, "we had better get ready for the night. The sun is almost over the cliffs on the west and there will be a short twilight on Mars. It will probably be freezing cold in a few hours."

"How long will the night last?"

"Almost the same as on earth. A whole day is just 37½ minutes longer than an earthly day. As we are about thirty-five degrees north of the equator and as it is late spring in this hemisphere, the night should not be more than ten hours."

"Then we shall need our tent and blankets! Where are they located from here?" I looked about me and discovered that the foot of the cliff over which we had dropped our bundle was not more than half a mile to the right. I pointed out the spot to my companions. Jack and I were deputed to go and bring it back, while Haworth made a fire on a sort of natural rocky fireplace and Mason cleared a site for our tent.

We made our way to the foot of the cliff, which rested on a sloping gravel pile, loose and treacherous. The bundle was near the top of the slope and we spent ten exciting minutes clambering up to it. Each step forward made scarcely half its expected progress, due to slipping. When we reached the top we paused for breath. The ground was barren of any vegetation at this level, but below on the red sandy wastes we could see brownish, strange plants here and there and a few miles beyond rose the edge of a tangled growth of branches and dry-looking vegetation which seemed to cover most of the valley. We dragged the weighty bundle back behind us as far as we could and carried the things piecemeal over rocks and ledges when they interfered with further progress.

● A very pleasant fire was crackling noisily on the hearth and Haworth had made investigation of the two sacks of food, finally deciding upon sliced bacon and beans—and mighty tasty they were, let me tell you, after our strenuous day! The light gradually went out of the sky and a thin breeze blew keenly. We soon had the tent set up on its two light aluminum poles, which we wedged firmly into the ground, and so arranged it that the fire was only a few feet from the open flap. We spread out our blankets and ate our beans with our knives from flat stones (for we had brought no utensils with us). The empty tins were set aside, of course, as they would serve us later on for cups. The bacon we toasted on the end of long sticks, a difficult thing to do, for the wood was dry and caught fire more easily than the bacon.

"Now," said Mason, "if we had some tobacco we could have a smoke!"

Jack started to remove his rubber space-suit and finally got a hand into his coat pocket, producing a package of cigarettes. "We'll have to go easy on them," he said, "they're all I have."

"I have a pouch and pipe in my pocket," put in Haworth and I added my quota, which consisted of my favorite briar and four ounces of tobacco in a tin. I had a splitting headache by now and I tied a moist handkerchief about my forehead, which gave me some slight relief.

Jack and Teddy both had cigarettes, as it turned out, and Haworth found two cigars. All told, it was a very limited supply for a prolonged visit, but we all agreed the present occasion was one for celebration and we allowed ourselves a few minutes of smoking, carefully extinguishing cigarettes and pipes and saving the remains when we were done.

It was now pitch dark outside of the flickering ring of light cast by our fire. We were woefully weary, all of us, and we rolled up in a row with our feet to the fire. As we lay there the moon rose. It was just a large pale dot in the dark sky and Mason decided it must be the outer moon, Deimos, for it rose in the east. About ten minutes later the inner moon, Phobos, showed above the cliffs on the other side of the valley and started traveling "Backwards"—a phenomenon made possible by its enormous speed around Mars of a third of a mile per second. We stared at it excitedly and thought of our companion marooned up there.

"Why he's signalling! See those flashes?"

Phobos appeared about as large as a baseball seen from the grandstand at a ball game. Half of it was in shadow and an infinitely minute flash of light could be seen flickering there. Mason puckered his eyes a minute, holding his hand up to ward off the wavering fire-light from them. Then he read aloud:

> (Dot-dash dot-dash-dot dot) Are you all right Planetoid Where is (dash dot dot-dot-dash—oh!) Where is Teddy answer.

The flickering ceased.

"Good Lord! He doesn't know I got aboard! Didn't you chaps tell him?"

"We didn't have time, Teddy. Dr. Mason and myself were aboard and had said good-bye to Bill when Dr. Bigelow and Jack came piling in telling us to hurry."

"Can we signal him?"

"We might build a huge bonfire—that's the only thing we can do now."

So we set about gathering wood and set a great pile alight, which soon roared fiercely in the cool brisk air. Then we waited breathlessly, watching Bill's response. Phobos was more than halfway across the southern strip of sky by now. Altogether it was visible only half an hour, and low above the cliffs most of the time. Mason

explained that this was due to our great depth below the surface of Mars.

"There he goes again!"

(dot-dot dot-dot-dot dot dot) I see your fire—where is Teddy—I see your fire—where is Teddy

But we were helpless to answer. The repeated question continued to flash down on us until the little moon started to sink behind the Eastern cliffs. Presently it was out of sight. Thoughtfully and soberly we went back to our blankets and to sleep.

CHAPTER IV

The First Expedition

● It was dark when I woke—dark and bitterly cold. The fire was a dull red ember, the sky ablaze with stars, smaller and brighter than usually seen on earth. I unrolled myself from the blankets and walked quietly over to the fire. But there was little warmth at it, so I threw on an armful of wood from the pile Haworth had left nearby. The flame caught and I was soon warm again. By the light of the fire I examined a piece of the wood, suddenly struck with the realization that everything I might touch or see was new and different from anything I had ever seen before.

The stick was about four inches through and dry as tinder. It had no pith, nor was its cross-section similar to earthly wood—for a dozen triangular holes ran up through its length and the inside of these tunnels was coated with a sort of thin bark. I looked about me in sudden interest and observed that a hoary rime edged the blankets of my companions where their breath had frozen. We all wore woolen sweaters under our rubber space suits and the collars of these were large enough to make a sort of cap that could be buttoned over the head. I pulled mine up snugly and walked a little distance to one side of the camp to find out what might be visible or audible of this new world in the darkness.

The valley below was a black pool of silence. I listened for several minutes and then I heard something go "snap" far below and a high-pitched squealing broke out and ended almost as soon as it had begun. There were animals in the valley, then! I patted my revolver with my hand to make certain it was there. With its help, I thought, we should have little to fear. I listened a long time but no further sound came to my ears.

I sauntered back to the fire, a little chilled, and warmed myself. I felt not in the least sleepy, so draped my blankets about me and sat up by the blaze in meditative mood. Men on Mars, eh! Here we were—five of us and ready for whatever might come. But what kind of creature dwelt below there? And what sort of life would it be, reptile or mammal or perhaps insects? What should we see when we went down there in the morning light? I was impatient and eager and thrilled all at once and sat there hunched up with an empty pipe between my teeth and my imagination running riot.

Presently the sky to the left began to lighten and I observed some wisps of cloud that shredded ghost-like from the cliff's top. Quickly the light spread—opalescent gray and silver. More and more boldly the top of the cliff stood out black against the growing light until I could seem to see each pebble and crevice on it, although it must have been five miles distant. Long fingers of mist spread out in the stirring dawn breeze and stretched themselves into weird attenuated shapes. Then the sky became tinged with pure gold, very softly and gradually, and the valley below me lost its dead blackness and was greyly visible. At the same time our campfire, though still blazing as high as before, seemed to lose its warm lights in contrast to the fading darkness.

Rapidly the whole world of sight became a seething swirl of vapors and silvery mists. The wind freshened and the valley boiled cloudily in answer and suddenly a gleam of blinding brightness spread from the encircling precipice, like a jewel set in a ring. The sun had risen.

Jack was stirring now and presently he stood beside me, yawning and stretching.

"Brr-a-a-w! It's cold, Mr. Bigelow."

"Put some more wood on the fire, if you like. Isn't it a glorious sunrise. Just for fun, what does the thermometer show?"

The reading was 10 degrees below zero, Fahrenheit.

By now the sun was entirely risen and was driving the concealing mists before it. I could see the night shadow-line retreating over the valley floor, very rapidly at first, and then more slowly as most of the area below became sunlit. The last vapors hung low in the shadow of the eastern cliff on our left.

Jack had not only put some more wood on the fire, but was toasting bacon as well.

"Wish we had some coffee!"

"I'm sure I put some in the bundle— a bag of roasted beans and one of green," I said.

"But no water, Mr. Bigelow."

"And we have none to spare from our flasks," warned Haworth through a mouthful of bacon. "We'll drink plain water and that sparingly until we find more."

I told him of the noise I had heard earlier in the morning and he nodded, rather relieved I thought.

"Food for us, eh? And if animals can live here, then water is to be found somehow or other, that's sure!"

We discussed the course of operations and agreed that this day we would spend finding a suitable camp near both water and firewood, for where we were it had been difficult to gather limbs in sufficient abundance from the sparsely spaced shrubs. We all agreed that the most likely looking spot was the conical hill. This was about three miles from where we had halted. We needed a permanent camp for Teddy's sake, as well. Accordingly we gathered our belongings, carefully scattering the fire remnants over the bare rock, and set off down the rough incline of the watercourse.

The first mile of descent occupied half an hour or more, even though the grade was easy, and we came out upon a stretch of red sand which extended away on our right more than three miles to the foot of the great precipice towering over the valley. The sand was dotted with the most grotesque figures, at least so they seemed. They were plants. I walked close to one and observed that the skin was dusty gray and slightly wrinkled, while here and there from it there cropped out short bristles as from adventitous buds. It was like nothing I had ever seen, but for this very reason somehow suggested a cactus-like growth to my mind. The shapes were most peculiar, no two being the same. It was as if an imaginative child

had fastened huge potatoes together with toothpicks to make animals of impossible form and contour. I poked one with my finger and discovered that it was not brittle, as was all the rest of the vegetation we had seen, but leathery to the touch and in some way vaguely chill and repulsive to me—like a reptile.

● Close upon our left hand now was the edge of the dense woods which filled the entire valley beyond. Here were strange trees, about forty feet in height, and a world of new and curious lesser growths—all brown or dusty grey in tone. We had not to break our way through them, for we followed the floor of the watercourse which, according to our observations of the night before, would lead to within a short distance of the mountain.

We came to the conclusion that the spring freshets must provide a considerable flow of water, for the dry channel was more than forty feet in width and ten feet deep. Its bottom was flat and mostly level sand, with an occasional smooth boulder. Such an easy path materially increased our speed and in little more than an hour we caught a glimpse through the weird and unearthly foliage of the conical hill with its flattened top. It was perhaps a mile distant and seemed to rise about three-quarters of a mile above the floor of the valley, though we afterwards found its height somewhat more than this.

"Lets cut through the woods straight toward it," suggested Jack.

"All very well," grumbled Mason, "but how shall I tow this mountain of canvas and wool through that underbrush?"

"Why not pile the stuff here," suggested Teddy from his seat on Jack's shoulders, "and leave me to stand guard while you spend the day exploring for water. You must be half dead carrying me all this distance, Jack!"

Indeed the spot was not badly chosen. At some time in the past a section of the bank had caved in and been swept down the stream, leaving a roofless chamber about ten feet across, off the main stream bed. For myself, panting beneath the heavy food sacks, Teddy's suggestion seemed too desirable to be ignored and I entered the tiny gully and dropped my load with a profound sigh.

We arranged the tent carefully and placed our loads neatly inside it, making a bed of soft sand for Teddy and pillowing his leg on a heap of the same. To his boot I attached a rope which I led over a boulder, rolled into place for the purpose, and then a ten pound stone hung halfway down the far side of the boulder on the other end of the rope. A hasty examination showed everything doing as well as could be expected.

"How long do I have to stay here, Doctor," he smiled.

"Probably three weeks or a month, old chap."

"Well, nothing for it then! I don't suppose anyone brought a book?"

Haworth nodded soberly, as if reminded of something.

"Now that I think of it, every man had better turn out his pockets—every last thing. We are castaways and must know our complete resources. Pile it all on this smooth sand beside Teddy and he can sort the stuff out and make a list of it. Do a thorough job of searching, mind!"

It was a curious assortment of odds and ends that we left with Teddy for classification.

"In particular," I said, on looking it over, "collect and preserve every last scrap of paper and all pencils."

Just then Mason glanced at his watch, as he laid it down in the collection of our belongings and turned his face up to the southern sky.

"It's about time Bill swung into sight, I think. We must signal him this time, somehow or other. Oh, if we only had a mirror!"

"There is a sort of concave mirror inside the top of my chemical box," said Jack. "I use it to mix things on."

With a shout of joy Mason pounced on the proffered mixing plate and placed it on his knees, facing south. The rocky cliff was still in faint shadow and he was able to reflect the sunlight against this background and so get control over his crude heliograph. In a few minutes the pale outline of Phobos half-showed over the cliff's top and Mason raised his mirror slightly and was ready to signal.

"What shall I say?"

But we left that to him and after thinking a second he read it to us as he sent it:

"All well Teddy safe here Planetoid wrecked found air but no water answer."

We stared hard, but could make out no answering flicker, and finally decided that Bill could not have seen the message, for the *Asteroid* had been landed about on the Phobian equator and this was just now showing to view. We waited a few minutes until nearly all of the little moon was visible in the sky when Mason repeated his message. This time we could see faint light flashing on and off, but it was quite impossible to be accurate about the signals and we could not read a word. After wasting twenty minutes Mason finally sent him another message:

"Cannot read your signal answer tonight."

Presently Phobos swung gradually down behind the southeast cliffs until nothing but the very top showed briefly. This, too, vanished and Mason glanced at his watch once more.

"I'm afraid we won't see much of him after tonight. Phobos is moving south day by day and though she only swings slightly north and south of the equator it will be enough to shut her behind these great cliffs. Probably we could keep her in view by climbing the mountain, if we had nothing else to do."

We had no more time, however, for anything else. Water must be found and we prepared ourselves to start on the search for it. Mason and I were to set off south along the watercourse, while Haworth and Jack Craig were to climb the hill and explore the region around its base. Mason wore a wrist watch, as did Jack, and the two timepieces were compared. It was within five minutes of seven o'clock by both instruments, although the sun was almost at its zenith.

"Let's fix an arbitrary hour of eleven o'clock and set both watches to that," said Haworth.

"Right," agreed Mason. "Later on I will determine exact noon and we can adjust the watches to run half an hour per day slower than earth time. Then we will be going on familiar schedules."

(To be continued)

(Illustration by Paul)

The mirror glowed and immediately Bolton faded into a misty wavering. Little cries of fear broke from the women. But Milak smiled reassuringly.

THE TIME EXPRESS

By Nathan Schachner

● If we accept traveling in time as at all possible, we can go a step farther and envision regular tours through time, as we today journey through space. Time travels might even become a regular business, or a means of pleasure or education.

What wonderful visions might open at that thought! We can imagine many ages linked together by regular transport; the year 3000, the year 4000, the year 5000 etc. might exchange thoughts and ideas, and even the accumulated wisdom of the ages.

But Mr. Schachner is not swept away by such flights of fancy. He tries to keep his feet on the ground and to work out logically and consistently what might happen were regular trips through time possible. He sees many limitations, many disadvantages; but above all he sees unbounded field for adventure. In this story we get one of the thrilling possibilities of the future.

● Denton Kels drifted unostentatiously off the aerobus, completely merged in a horde of chattering anticipatory tourists. A hundred heads turned to stare at the great gleaming crystal timedrome. Over the entrance to the long, semi-cylindrical building a legend flashed back into their fascinated eyes.

"HOOK'S TOURS THROUGH TIME" it screamed in red neon lights, twenty feet high, "PERSONALLY CONDUCTED ALL-EXPENSE TOURS INTO THE FUTURE. VISIT YOUR GREAT GRANDCHILDREN IN TRADITIONAL HOOK COMFORT. THE LAST WORD IN TOURS."

A pleasurable sigh exuded from the hundred, then the chattering broke out afresh. The modulated, penetrating voice of the tour leader hushed them into sudden silence.

"The Time Express starts in half an hour, ladies and gentlemen. We shall have to hurry. Kindly take your places on the passenger conveyor."

The tourists bustled on board the long-grooved ribbon belt, scrambled into the nearest seats. Denton Kels followed meekly. He was a mild looking man in the early forties, slightly bald with wisps of graying hair. His features were inconspicuous, his eyes speculative. An ideal operative for the special investigation in which he was employed by the World Council in this year of grace 2124 A. D.

The conveyor shot into swift, noiseless motion, hurled them through the great portal into the spacious convex interior, and came to a smooth stop before an ellipsoid of mirror-like metal, one hundred feet long on its principal axis. It was suspended in air some twenty feet off the ground by powerful magnets set in the curving roof overhead. A steep movable ramp led into the interior. From every side huge burnished reflectors focussed upon the express. They were quiescent now; when they blazed into activating energy, the metallic ellipsoid would vibrate upon its tremendous journey.

Kels had his tickets and identification passport carefully scrutinized by a hawk-faced individual who looked uncomfortable in the livery of *Hook Tours*. There were others too, in conventional civilian clothes, who stared at the tourists with probing eyes as they streamed excitedly up the ramp.

Kels smiled thinly. His papers were in order. Denton Kels was his name and he was a retired butter and egg merchant. The hawk-faced individual returned them to him without comment. By not so much as a flicker of an eyelash did he show recognition.

Kels put them back carefully into his wallet and shuffled on board in back of two giggling young girls.

The interior of the express was fashioned entirely of the peculiar mirror-like metal. Chairs, tables, beds, instruments, even table cutlery, gleamed monotonously. This metal was particularly sensitive to the activating impulses from the reflectors.

The ramp led into a small bar at which a white-coated attendant was rapidly filling metal cups with a slightly yellowish, fizzing drink.

"Every tourist must drink a cupful," he chanted.

Kels drank his portion obediently. It was lukewarm and rather nauseous to the taste. The drink was radioactive, containing in suspension colloidal particles of the mirror-like metal. Their dispersion through the body rendered one amenable to the influence of the reflectors.

The tour leader was much in evidence. He was a young man with fair hair and smooth rosy cheeks. Just now he was flushed with the exertion of herding his flock to their quarters. His name was John Bolton and he hated his job. But one must live and the pay was good.

"You will have just fifteen minutes to find your quarters, and attend to your luggage," he announced. "At the end of that period a gong will sound. You must gather immediately in the central salon, and take your seats. The Express starts ten minutes thereafter. The Company is not responsible for accidents to any tourist who fails to obey these instructions rigidly. The room numbers are on your tickets."

Kels looked at his ticket, found his room number to be 36. A uniformed attendant, in the familiar Hook blue-

and-gold, directed him down a long corridor. His room was the farthest on the left.

It was small but sufficient. His luggage, a battered serviceable suitcase and a small hand bag with a peculiar lock to it, was already set neatly against the bedstead.

Kels went over and locked the door on the inside. His bright blue eyes raked the room for possible hiding places. There were none. Bare metallic walls stared back at him.

Disregarding his suit case, he knelt before the handbag; his surprisingly long fingers worked deftly at the lock. It snapped open. Kels reached in, took out a tiny, thin-barreled dynol pistol that held a magazine of fifty almost microscopic dynol pellets. On striking its target, the pellet exploded into thousands of tiny slivers of steel. The victim died almost instantaneously, no matter how superficial the original impact.

● Kels hefted it speculatively, slipped it into his pocket.

Then he drew out a blue slip of paper. It was a photostatic copy of a memorandum. He read it with frowning forehead.

"The World Council of the year 4600," it ran, "has managed to send us a warning. It is in possession of information to the effect that some one in the past is attempting to smuggle plans and specifications of power machinery via the Time Express into their time of 4600. Such plans the World Council of 4600 considers contraband of the most dangerous order, the mere possession of which is punishable by death. It is believed that the smuggling attempt will be made from our time of 2124 via the Hook's Tour of July 17th.

"The World Council of 4600 notifies us that unless we prevent such smuggling, all further tours to their time will be strictly prohibited. Inasmuch as the World Councils of all periods prior to 4600 have practically persuaded that Council to permit tours to be routed through its time into future ages, it is readily seen how such a limitation would be catastrophic. Not only would the broadening aspects of travels in time on our citizens be unduly curtailed, but a gigantic industry would suffer financially."

Kels permitted himself a smile at that, and read on.

"It is therefore imperative that the smuggler be captured, and the contraband seized and destroyed. All operatives of the Secret Service are to proceed accordingly."

"Chief of the Secret Service Division,
World Council, 2124."

Attached to the photostatic memorandum was a strip of paper with a typed message.

"Attention Operative, Denton Kels.—You will take complete charge of field operations. You will be held responsible for their success."

Kels smiled wryly, took out of an inside pocket a tiny flame-inducer, flicked it into a bright hot glow. He held the memorandum against its tip, watched the paper curl into impalable ash. Then he deliberately opened the locks on his bags and left them open. Even his luggage was not immune from careful search; every Secret Service operative proceeded on the assumption that very other operative was suspect.

Kels sat down and lit a cigarette. A bother over nothing much, he thought. He had heard something of this strange civilization of the future where machinery was anathema; where everything was done by human hands, or by tools fashioned by human hands. The course of civilization had been reversed. Kels knew vaguely the reason for this abandonment of power. Little bits of information had filtered back through time. Yet he thought the alleged reasons eminently unsatisfactory. He was sufficiently a child of the present machine civilization to be unable to conceive that it was, or ever could be, anything but an unmixed blessing.

He got up and shrugged his shoulders. After all, it was none of his business. The Council of 4600 had a right to make its own regulations, and have them adhered to without meddling from the past. His orders were definite; catch the smuggler and destroy the plans.

A gong sounded clamorously. It was the signal. Kels unlocked the door, went out into the corridor, was swept into the current of hurrying tourists. By the time he caught his breath, he found himself seated on a metal chair in the salon, discreetly in the rear of the motley array of both sexes, thrilling to the thought of a cruise into the future. A little platform reared itself at the farther end of the salon, and on it stood John Bolton, the tour leader, waiting for the hubbub to cease.

Kels nodded unobstrusively. At once various soft-shoed individuals on the outskirts of the crowd slipped silently out of the salon. They were operatives. Kels settled back comfortably into his chair, knowing that every inch of the Express, every bit of luggage belonging to the passengers and the crew, would be submitted to a painstaking search.

Bolton raised his hand for silence. All necks craned in his direction, all ears were attuned to the pearls of wisdom that were about to drop from the lecturer's lips.

"Before we commence on our tremendous venture into the future," he began in his modulated, penetrating voice, "it would be well to acquaint ourselves with something of the history of time traveling, and the principles upon which it is based."

An elderly man in rusty black with a high intellectual forehead snorted contemptuously, leaned back and closed his eyes. A professor of science, on his sabbatical, no doubt, to whom the elementary explanations of the Hook's man would appear childish.

Bolton went on earnestly. "Because of the rapid advances that have been made in the science and art of time traveling, it is sometimes forgotten that the penetration of the future was deemed an absolute impossibility only nine years ago. It was in 2116 that Levallier, of immortal fame, first invented his crude time traveling machine. He was greeted with mockery, but in front of the assembled sceptical scientists of the world, he and his machine vanished from view. Three days later, during which interval the hall in which it had been housed remained under constant supervision, the machine reappeared, and Levallier staggered out, wild eyed, incoherent.

"He spoke vaguely of great astounding civilizations of the future, in which time traveling, based on his invention, was an accomplished art. He spoke of general impressions, of marvelous advances in science, but somehow he could remember no sharp details. Nor could he give a coherent description of any machine, of any invention of the future that he had observed.

"Trained scientists went with him on further ventures into the future, with the same results. It was impossible to bring back any but the most general observations. It seemed as though nature, outraged at man's bold penetration into the mysteries of time, revenges herself by raising

an impenetrable barrier against the use of future knowledge by men of the present. And that, our scientists and philosophers assure us, is philosophically correct. It would be an absurdity for us to avail ourselves of all the knowledge into which man will gradually evolve, before that knowledge even came to the race. Even I, who have accompanied this tour some thirty times, could not describe in detail any invention of the future."

● A hatchet-faced spinster in mannish clothes said in a loud masculine voice: "Does that mean we won't be able to bring back anything from our travels?"

"Not a thing."

The spinster sniffed with explosive force. "Well, I declare! I must say, young man, your Company has imposed on us. What is the good of an expensive tour if you can't bring souvenirs back to show your friends that you have been away!"

A stout placid man with white hair and old-fashioned spectacles wagged his hand upright like a timid schoolboy. He caught the lecturer's eye, stammered and blushed. "Why don't Hook's make up tours into the past? I—I'm all-fired anxious t' see old grandpop agin."

All eyes fastened on the old farmer from the hinterland.

Bolton answered courteously: "A very understandable and praiseworthy desire on your part, Mr. Hardscrabble. Unfortunately, we have not achieved traveling into the past, and our philosophers tell us we never shall. We may move forward, and return to our own time, but not for one second may we unroll the past. That is why the people of the future cannot come back to us."

A thin young man with an ascetic face and prominent nose looked up from a note book in which he was busily scribbling.

"Mr. Leader," he asked, "can you explain the theory of time traveling—scientifically, I mean? I'll get extra credits if I can hand in a good thesis on the subject to my Prof."

"I'm glad you asked," Bolton said heartily, though there was murder in his eyes. "The Company encourages students on its tours. There is nothing of great cultural value than traveling, either in space or in time. I shall try to explain the theory of time traveling as simply as possible."

The professor on his sabbatical was snoring loudly now. Another man, tall, lantern-jawed, groaned and shut his eyes ostentatiously.

"It has long been known," Bolton went on unheeding, "that the faster an object travels in space, the slower its growth processes. In other words, passengers in a rocket plane traveling at the rate of one thousand miles an hour, who according to the standard time calculations of instruments affixed to the ground, are one hour older at the end of that distance, are actually, as far as their perceptions and bodily reactions are concerned, not quite as old as that by the very small fraction of a second.

"Now multiply that speed until it approaches the speed of light, if you can conceive passengers on a rocket ship traveling that fast. At the end of one hour by normal earth standards, they would have perceived, and their bodies would have aged, only a fraction of that time. At the very speed of light, our travelers would have achieved immortality; to them all time would be condensed into a single simultaneous eternal sensation; there would be no growth, there would be no decay."

Bolton's voice was getting bored; he fell into the singsong of the professional lecturer.

"So that," he continued, "if we had rocket ships that could traverse interplanetary space, and we could build up a speed of, let us say, 180,000 miles per second, our intrepid travelers could take off today, cross the uncharted regions of space to Andromeda, half a million light years away, swing back at the same tremendous velocity, and come back to our earth as it will be one million years from now, yet themselves aged only a few terrestrial years."

Kels was listening half attentively. His faculties were fixed more on the smuggling problem in hand. His eyes roved over the motley assortment of tourists, probing, speculating. Which of these was the resourceful, unscrupulous smuggler; where had he hidden the contraband plans? All this while, he knew, his men were going over the Express with a fine tooth comb. But he had a feeling that they would not find anything. The smuggler was playing for big stakes. He stared again at the faces, some rapt on the lecturer, other blank, some drowsy or frankly asleep, others pretending interest. The two giggly girls were casting inviting glances at the earnest young student, nudging each other and going off into muted peals of laughter.

CHAPTER II

Into the Future

● Bolton droned on. "Now of course it is impossible for us to achieve that tremendous journey in space, but Levallier evolved a brilliant idea. Why not localize the journey? We have available in our own bodies, in every bit of matter about us, speeds approaching the required velocities. I refer to the atoms in our composition. They vibrate very rapidly. Find some way of increasing their vibrations to nearly the limiting velocity of light and the problem has been solved. We need not travel out into interstellar space. Mere direction of speed does not effect the slowing up of the time process. Accordingly if our atoms be made to vibrate more rapidly within the present range, we remain as a corporate entity stationary in space, yet we have slowed up in time while the time of the outside world flows past us.

"With that concept in mind, Levallier set to work. He experimented until he found a new metal alloy which he called *vibratium*. Its atoms are peculiarly susceptible to activation. The Time Express is made of that alloy; the liquid you were required to drink contained it in colloidal suspension. You will have noticed what seemed to be flood lights surrounding the Express. Actually they are emitters of powerful electrical impulses. These impulses, striking the atoms of the Express, cause them to vibrate with a speed of the order of light waves. We slow up in time, the world proceeds at its normal rate, and in what seems to us three hours, we have arrived at our first stop; the year 2850."

"Why that particular age?" some one inquired.

"Because it is especially interesting," Bolton explained. "The Messner atomic motor had been invented some ten years before, in 2840, superseding all other forms of power. You will have a chance to study a civilization in which practically all manual labor has been abolished; where the people can lead easy, effortless lives without the daily grind of making a living." He sighed and continued. "Our second stop will be in the year 3975, just after the

World Council of that era destroyed the Messner atomic motor as well as every other form of power machinery in the world. The Council claimed that the peoples of the earth had deteriorated physically and mentally as a result of idleness and luxury; that only in hard manual labor, in constant striving with a difficult environment was their salvation."

His voice held scorn. "Our third and last stop will be in the year 4800. Civilization has reached heights again, but without the aid of power machinery. Mankind works hard, and claims it enjoys its labor. But the World Council of that era takes no chances; it knows there is an undercurrent of discontent. Every reference to machinery in their records and books has been deleted, the museums are denuded of all models, for fear that malcontents may be able to evolve new machines. Possession of anything relating to a machine is punishable by death."

An old lady with soulful eyes and hectic artificial red on her withered cheeks spoke up: "Why doesn't your tour extend beyond that period? It would be thrilling to see our wonderful earth millions of years ahead; when man will have divested himself of all gross impurities and approached the godlike, without distinction between male and female."

Kels wondered what a searching psychoanalysis of her unconscious would disclose.

"That is because the Council of 4800 refuses to permit any time traveling past their own era. They fear that the future beyond may have refashioned power machinery, and they are unwilling to risk the contamination of such ideas upon their people. As a matter of fact, it was only after a long struggle that they even permitted us to bring tours into their era. We suffer under innumerable restrictions. We may visit certain specified points of interest under heavy guard; we may not converse with any citizen of 4800 except the guards and trusted officials. But you will find all that in the explanatory booklet the Company issued with your ticket."

He glanced at the time dial on his wrist. "Our time is up. We are ready to start." He reached back to press a button.

An operative stepped softly into the room, caught Kels' eye, raised his left eyebrow. It meant the search had been fruitless. Kels was not disappointed. He nodded slightly. The operative moved forward to Bolton, laid a restraining arm on the tour leader.

Bolton turned angrily, saw something in the other's cupped hand—the emblem of the Council—and subsided. The operative whispered long and earnestly.

The tourists buzzed, even the sleepers were awake now and wide-eyed. Something unusual was about to take place. Kels searched faces around him carefully for evidences of guilt, but there was only interest, or vague uneasiness.

Bolton was seen to nod reluctantly. He turned to the tourists, his ordinary high color a deeper pink.

"Just a moment, ladies and gentlemen. I am going to ask you to be very patient and forbearing under what is to occur. And please remember that the Company is in no wise to blame for the insult about to be put upon you. We must bow to the superior authority of the World Council, represented here by this gentleman from the Secret Service Division. And they in turn are not at fault. The World Council of 4800, the terminus of our tour, is responsible."

His voice rose angrily. "They fear that someone from our time is attempting to smuggle plans of machinery into their era. According to their laws such smuggling is punishable by death." He waxed sarcastic. "Such are the blessings of their machineless civilization; such the universal content of their people."

The operative whispered something. It subdued Bolton's rising choler.

"I am sorry," he said. "It is therefore necessary that each and every one of you be searched now, before the commencement of the tour. There are female operatives for the ladies. Please submit with all good grace."

A clamor of voices arose, like the buzzing of angry bees. The tourists were irritated, indignant. Only the two giggly girls took it with peals of merriment. The earnest young student to their right blushed and tried not to look at them. The tall lantern-jawed man rose from his chair and said loudly:

"This is an outrage! It is an intolerable invasion of my rights as a free born citizen of the World Republic of the year 2124. Who are these upstarts of 4800, people who haven't even been born yet, that I should submit to the indignity of a search of my person? I won't stand for it."

"Your indignation is well grounded," Bolton soothed, "yet we must submit, if we wish to go on with the tour."

"Then I shall not," the tall man retorted vehemently. "Rather than submit to such intolerable tyranny, I shall withdraw from the cruise. To hell with the future! the good old present is good enough for me."

Slightly mixed, Kels reflected, but praiseworthy in sentiment. Yet the man protested too much. Could he be the smuggler, seeking a way out?

Bolton looked inquiringly at the operative.

The Secret Service man; his official designation was No. 12, and he was a good man; spoke for the first time.

"The gentleman is at liberty to withdraw. We shall only search those who will continue on the trip. If there are any others who feel as strongly about this unfortunate situation, they may retire from the Express now."

He looked inquiringly around, but no one else stirred. The mutterings subsided; there were even those, among the younger element, who began to look upon the whole affair as quite a bit of a lark. The lantern-jawed man stalked angrily out of the salon. He paused at the door to fling back: "I'm not through. I'll sue the Company for this." Then he was gone.

The room swarmed with operatives, male and female. The search commenced; no one was exempt, not even Kels. It was conducted courteously yet thoroughly. Every bit of clothing was gone over, felt, for sewed-in documents. Every suspicious thickness was examined. But nothing was found. And Kels, standing back after his own examination, had not expected otherwise. Unless the smuggler was the lantern-jawed man who had withdrawn, he would be much more resourceful than to be caught redhanded with documents on his person or in his luggage.

Kels felt it would be a battle of wits, and he was ready. The life histories of every one on the present tour had been checked by the Secret Service Division; especially of those who had been on former tours. They would most logically be possible smugglers, as having already estab-

lished contacts with the elements of discontent in the year 4800.

But there were only a few; notably the science professor on his sabbatical, and strangely enough, the industrious young student who was taking such copious notes. They would bear watching.

At length No. 12 called a halt. He bowed to the tourists, apologized for the trouble they had been compelled to undergo, and withdrew with his operatives.

Only Kels remained, a mild-looking retired butter and egg man taking the Grand Tour.

Bolton looked relieved. "Because of this unfortunate occurrence, we are some twenty minutes late. But we start at once. I shall turn on the translucence so that you may watch what happens."

He pressed a button, and everyone gasped. The metallic walls became clear as crystal, they seemed to be suspended without footing in mid air in the great timedrome.

"We are off on our journey through time," Bolton said resonantly, and pressed another button. The great reflectors surrounding them on all sides pulsed into beating purposeful life. Long blue streams of energy crashed across the void, bathed each startled tourist in an unearthly blue glare. Even Kels felt a trifle uncomfortable.

Yet nothing seemed to happen. Someone uttered a disappointed little cry. Then the great reflectors, the timedrome itself, hazed into rapid, dancing vibrations. The vibrations picked up speed until all that could be seen was a continuous bluish-gray blur.

The tourists watched in dazed wonderment. Minutes passed, then the scene gradually cleared. The blurred haze deepened until it was a continuous black. There was nothing more to be seen. The tourists found themselves staring into the absolute absence of light, of form. It was sheer void.

Bolton switched off the translucence. The Express formed about them with its solid comforting walls. The people breathed sighs of relief; it was unbearably horrifying to probe that pitchy void.

"We are vibrating now at our maximum of 183,500 miles per second. At that velocity we are invisible to the world of 2124 or any other time until we slacken our tremendous pace."

"How shall we stop, then?" a timid lady inquired.

"Simple enough. The timedromes of the future possess batteries emitting electrical impulses similar to ours, only much more highly evolved and more powerful. They are set in reverse, to slow down the speed of vibration in our atoms to normal. The first Express of Levallier simply went on and on under its initial impulse until the braking forces of gravitation and interplay of atomic forces brought him to a halt. Fortunately he stopped in a time when the Time Express was highly developed, and they were able to send him back."

● But Kels was not listening to these arid discussions.

He had retired to his room, and sat in his curved metallic chair, smoking a cigarette. He pondered his problem. He frankly acknowledged to himself that its solution would not be easy; the fact that no sign or trace of the concealed plans could be found, nor any inkling as to the smuggler himself, showed him that. The crucial time of course would be when the Express reached the year 4800. The Council of that era would make its own search of the tourists and establish an extraordinarily rigid guard over their wanderings, but somehow, Kels did not place any faith in the efficacy of its efforts. It depended entirely on himself whether or not the future of 4800 and later would become a sealed book forever. He sighed, crushed the stub of his cigarette, lit another, and settled himself comfortably with his thoughts.

He was startled by the sudden striking of a gong. Outside his locked door he could hear confused noises. He glanced at his time dial and swore softly.

Three hours of Express Time had passed without his being aware of it; and 626 years of outside world time. They had reached the first stop, the year 2850.

He went swiftly out into the corridor, pushed his way through the milling throng of tourists into the salon. Bolton was vainly trying to herd them into some semblance of order.

"We have reached the year 2850," he shouted to make himself heard. "Before proceeding with our regular sightseeing tour, we shall have luncheon. The Company gives you an option; you may remain on board and eat from our justly famous menu, prepared in accordance with the best standards of our own time, or you may be served a luncheon of the future in the dining hall of the timedrome. I can assure you that you will find it a novelty."

The two *jeune filles* set up squeals of delight. "Goody, goody; we vote for the future." They seized the painfully embarrassed student by either arm and gazed languishingly into his reddened face. "You will escort us, Mr. Pennyfeather, won't you?"

"I—I've eaten meals in 2850 before," he stammered.

"Splendid! Then you'll be able to pick out the best dishes for us." And without giving him a chance to object they whirled him gaily down the moving ramp that had been set against the Time Express.

Professor Melius snorted. "The last time I traveled there was no option. I eat on board." He went rapidly toward the dining hall. The remainder divided into rather equal parties, one contingent electing to remain and the other to venture daringly into novel gustatorial realms. It was noticeable that the seasoned travelers, with the exception of poor Pennyfeather, unanimously preferred their accustomed food.

Kels hesitated, then went down the ramp. The timedrome was an enormous crystal; the area around the Time Express still shimmered blue from the retarding beams. But there were no overhead reflectors. The energy came direct through the ether from central power stations.

Some hundred yards away from them rested a great crystal sphere in midair. No magnets were visible. It was of tremendous dimensions; at least five hundred feet in diameter. A Time Express of the future about to take off for still remoter eras. Tourists, dressed in shimmering, close-fitting metallic garments were embarking. They came flying through the air with effortless ease, and disappeared into the hollow of the sphere. A tiny box-like protuberance between their shoulder blades, powered from the great central atomic motors, provided the lift necessary for aerial locomotion.

Kels hastened into a fantastic dining room. There were no tables, no sign of food; only luxurious lounging chairs with wide arms in which there were inset tiny buttons. Kels sank into one of them, wondering. The room was half filled with tourists of the various ages between 2124 and 2850. They examined each other with sidelong

curious glances and gaped around the room for signs of food. Pennyfeather was trying to explain something to his girl companions.

A melodious voice filled the great room, coming from no visible source.

"Men and women from earlier times. You are welcome to our age, the finest flowering of all civilization. We toil not, neither do we work. All physical motion has been abolished as far as possible. We devote ourselves to the cultivation of our senses, of our faculties of appreciation and enjoyment. The Messner atomic motor has made all this possible. Survey our era; you are unrestricted in your ramblings. See in all its glory the greatest civilization since time began. Then travel on and observe how barbarians of the future destroyed it all, left no trace of our existence. We stand preeminent, supreme. Even in the inhalation of food, we exercise a minimum of effort. Relax into your seats, and press the button at the base of the arm. That modicum of effort is necessary, but our scientists are at work on the problem. We understand that within twenty years the entire process will become automatic upon the mere thought of food."

The voice ceased. Kels looked downward, pressed the tiny inset metal disk. At once invisible essences, odors, perfumes, surrounded him, passed into the cells of his skin, into his mouth and nostrils. Gradually his mouth glands watered agreeably, his stomachic lining ceased its peristaltic craving for food, and the sensation of having achieved a many course banquet stole over him in drowsy lethargy. He had eaten. Rather novel, he thought, but hardly a diet he would care to subject himself to forever. No wonder the race deteriorated!

Bolton came in later with the other contingent, positively exuding porterhouse steaks and huckleberry pie.

"Those who wish may join in the tour of the city of Great New York under my leadership. Those who prefer making their own itinerary may do so. There are no restrictions placed on us by the very courteous Council. Remember however, that the Time Express leaves sharply at midnight."

He consulted his time dial. "It is now 1 p. m., our time. Govern yourselves accordingly."

Professor Melius and Pennyfeather glanced at each other significantly and, as if moved by a common impulse, walked rapidly out of the timedrome. The others clambered on board a motorless aerial bus powered by the universal beams. Kels made a move as if to follow Melius and Pennyfeather. He hesitated, frowned thoughtfully and returned to the Time Express. He was here on business, not for mere sightseeing. The Time Express was the focal point of the smuggling venture; he must not allow himself to forget that for an instant.

He moved catfootedly through the deserted Express; even the crew had gone off to view the delights of this decadent civilization. He tried the doors of Melius and Pennyfeather. They were locked; but that was no obstacle. A few moments of manipulation, and Kels was inside, first in one room and then another. He went carefully through their baggage, tested the walls, searched in the bedding, but with no result. There was nothing; no plans, no contraband matter, not even a book. According to the rules no books or pamphlets of any kind were permitted, for fear of hidden references to machines.

Then he went back to the salon, and ensconced himself in a chair where he could see the ramp and entrance ports. It was tedious watching, but Kels was possessed of a rare quality of patience. At about eleven in the evening, their own time, the tourists returned, chattering, laughing, breathless with the wonders they had seen. Exclamations of admiration, of delight, mingled with some critical dispraise of the already manifest physical and mental degeneration of the race, came floating to his sharpened ears.

CHAPTER III

The Year 4800

Kels passed each one in review, raking their innermost souls for some sign of furtiveness. There was none. Then, almost at the stroke of midnight, Professor Melius and young Pennyfeather came hurrying on board. Their faces were set, sharp etched lines furrowed their brows. At the salon they swerved, each disappearing to his own room without a word of greeting to their fellow tourists.

Kels followed their retreating figures with a mild chuckle. It was evident that they had met with disappointment in whatever mission they had set out to accomplish.

Satisfied, he withdrew to his own room, locked himself in, and promptly went to sleep. Even the rapid vibration of his body when the Express started into the future again did not awaken him.

It was the gong that awakened him out of a healthy dreamless sleep. He drew on his clothes, went hastily into the salon. A first glance showed Kels that something had gone wrong. Something of hysteria manifested itself in the distracted faces of the tourists, while Bolton was white under his florid skin. Only Melius leaned against a wall, sardonic, cool.

"Please do not feel alarmed," Bolton tried hard to keep his voice steady. "There must have been a miscalculation, and our time dials are functioning too rapidly. We should have reached our destination in 3975 an hour ago, yet we are still vibrating. Stay quietly in your seats; no doubt we shall come to a halt any moment."

"May not the timedrome of 3975 have been destroyed?" Melius interjected quietly from his vantage point against the wall. "We know that the revolt against the machines was successful just before that time."

"But the timedrome was left intact by the World Council of that year."

"Does the Time Express inevitably come to a halt at the exact moment in time on each trip?"

"No-o-o," Bolton admitted. "There is sometimes a lag of several days."

"There's the answer then," Melius said wryly. "The lag in time on this particular journey must have extended over a year. We know from what we are told by the denizens of 4800 that the Council of 3976 decided to destroy the timedrome; and that it was not rebuilt until 4790. That is why your Company was never able to arrange for any intermediate stops."

There was a sensation. Many of the women were openly hysterical now; cries of alarm, wails, moans of despair came even from the men.

"We are lost in time!" someone cried. "We'll keep on going forever, until the end of the world!"

The two young girls started to giggle, high-pitched, hysterical, interminable. There was no stopping them. Bolton looked around helplessly; he could not stop the mount-

ing panic. Melius surveyed the frenzied throng with sardonic malice. In another minute there would be frothing madness, a riot in which irreparable damage might be done.

Already a wild-eyed man was pounding on the metallic wall of the Express, in an insane desire to break through.

Denton Kels walked slowly to the platform, pushed the numbed Bolton gently aside. His mild inconspicuous features stared down at the fear-stricken, distorted faces. His personality was not commanding, yet somehow a sense of quiet confidence exuded from him. The tumult died gradually, even the hysterical giggling slackened. Then he spoke.

"What are you afraid of? Granted that we vibrated past 3975 through some unforeseen mischance. That does not mean that anything has happened to the timedrome in 4800. It would be an impossible coincidence for that also to have been destroyed. We shall stop there, as the tours have always done. There is nothing to worry about. You have lost the opportunity to do a little sightseeing, that is all.

Something of the man's quiet power came across to the bewildered people, made them feel ashamed of their causeless panic. Voices arose, eager to show the essential bravery of their possessors, in cries of approval. The crisis was over!

Kels slipped off the platform, merged indistinguishably with his fellow passengers. He desired no undue notoriety.

Ten minutes later, seated in the dining chamber, eating and chatting gaily, men chaffed each other on their groundless alarm. The day passed, Kels ceaselessly on the watch, without result. The smuggler, if smuggler there was, kept well hidden.

As the time approached for the halt in 4800, however, there were evidences of uneasiness. Logic had been with Kels, but man, especially in the mass, is not normally a logical creature. The cheerfulness died down, conversation became monosyllabic, inconsecutive. Men listened to the beating of their hearts. The great illuminated time dial in the salon became the cynosure of furtive eyes. The minutes flashed by inexorably. Kels had a momentary vision of the Express breaking through the inhibiting timedrome, careening on and on in time with its cargo of helpless passengers.

A great shout aroused him. The illuminated arrow of the time dial flicked to the appointed hour, and almost simultaneously, the pointer of the velocometer began to swing slowly backward. The timedrome of 4800 was functioning normally. Men slapped their nearest neighbors heartily on the shoulder, laughed, said unmeaning things. The strain on them had been terrific. Yet no two had taken it alike. Pennyfeather had been flushed and shaking, Bolton white, yet steady; only Melius had preserved his mocking sardonic calm.

● VERY slowly the Time Express returned to normal atomic vibrations. The white of Bolton's face had given way to a high color. It was with difficulty that he kept his voice even.

"Now please remember," he said. "We are in the year 4800 only on sufferance. The slightest false move on anyone's part and we shall be packed back incontinently to our own time, and all future tours prohibited. Keep close to your guards; do not attempt any conversation. Follow these instructions carefully and you will have no trouble. All ready now."

The great exit port slid slowly open. Kels stationed himself unobtrusively to one side.

There was a general surge of eager tourists for the port.

"Stand back, everyone." Power, infinite authority was in that voice. The tourists fell back, amazed, and a man stalked into the salon. Kels' gaze flicked up at him, held taut.

He was a giant among men, over seven feet tall; broad of shoulder and sinewy of body, yet gracefully proportioned. His brow was wide and calm, his eyes luminous with informed intelligence; his features instinct with dignity and repose.

A fluttering sigh of admiration greeted him from the more susceptible ladies. The men among the tourists felt uneasy, small, in silent self-comparison with this god-like giant of the future.

Behind him a company of six similar beings moved silently in, took up their stations at the entrance port. Strapped to their chests were oval disks, pierced in the center by a tiny hole. Kels learned afterward that these were the only weapons of offense possessed in that marvelous time. Each disc contained nearly a thousand tiny arrows, exquisitely sharp and of toughened metal. An ingenious catapult arrangement inside the disk, activated by a peculiar contraction of the soldier's chest muscles, shot the slotted arrows through the orifice with astounding force. They could penetrate two inches of armor plate. To such astonishing virtuosity had the purely hand-fashioned civilization of 4800 risen.

The leader surveyed the somewhat awed tourists as if from an Olympian height. Kels felt particularly small and undeveloped when the calm luminous eyes swept over his insignificant form. But there was nothing of condescension, rather a gracious courtesy, in the man of the future when he spoke again.

"People of an earlier time," he said, "you are welcome. It is unfortunate that we may not make you free of our time and land, but you bear within you, unwittingly, it is true, the seeds of death and destruction. You represent an early stage of the Machine Age that ultimately caused the almost complete degeneracy of the race. It was only through the mighty effort of a few that mankind survived and continued to evolve. The curse of machinery has been eradicated, yet there are misguided ones among us who still long for the slothful ease that only the slavish machines could grant them."

Kels watched Melius. The professor's dark eyes burned; gone was his sardonic ease. Pennyfeather glanced swiftly at him, moistened his lips nervously, and glanced away. The calm voice continued.

"In order to save them from their folly, and to prevent the loss of our hard-gained achievements, the World Council has decreed death to any one, be he a denizen of our own age or any prior age, who attempts to introduce any type of power-operated machine, or description or plans thereof from which it might be fashioned."

His grave eyes took in the breathless tourists, and each shrank guiltily at the impact of that luminosity.

"On former tours the restrictions have been faithfully observed, but information has come to us that some foolish individual among you has been rash enough to bring the forbidden plans with him, in the thought of disposing of them to our malcontents for a substantial reward."

"If this be so," and his voice grew measured, "let the culprit freely confess his crime, deliver the plans to us

for destruction, and he shall not be harmed. Let him grasp his chance while he may."

He paused. There ensued an oppressive silence. The tourists, men and women both, shrank into themselves, seeking each other with averted eyes. Pennyfeather was pale as any ghost; Melius with folded arms stared back defiance. Yet no one came forward.

"Very well then," the man of 4800 sighed as at an unpleasant duty. "Each of you will pass in front of me, slowly, one at a time, then out into the timedrome."

Bolton protested, his voice respectful.

"It is unnecessary to search our people, Eltor Milak. That has been done by the Council of our time at the point of embarkation."

Milak smiled slightly.

"I know the World Council of 2124 has been conscientious, but we have certain methods. It will not prove embarrassing. Let you be the first one, John Bolton, to show your people who are innocent, that they have nothing to fear."

The tour leader stept forward without hesitation, passed slowly in front of the inquisitor. Kels leaned forward eagerly. He noted the tiny mirror set in Milak's scarlet tunic, where the soldiers had their arrow catapults.

The mirror glowed, and immediately Bolton faded into a misty wavering. Little cries of fear broke from the women, gasps from the men. But Milak smiled reassuringly.

"Do not be alarmed. It is merely a development of your earlier X ray. See!" He pointed to a dark blob in the nebulous form. "Any concealed substance on the body shows up plainly."

The mirror ceased glowing, and Bolton slowly regained solidity. He was rather pale.

"You have a leather-covered booklet in your inside pocket," said Milak. "Let me see it."

Bolton hesitated, then took it out silently. Milak leafed through it carefully and smiled.

"Ah, you write very fair poetry," he observed pleasantly, and returned it to its owner.

Willingly enough the tourists filed in procession before the giant man of 4800 and were searched with the penetrating glow of the mirror. Nothing untoward was discovered; several small secrets perhaps about which Milak maintained a discreet silence.

Kels was the last. He had deliberately hung back. The others were out in the timedrome, waiting. The giant gazed down at the insignificant, mild-looking little man, glowed his mirror at him casually. But Kels was already slipping his dynol pistol out of his shoulder holster, handed it over to Milak without comment.

The man of 4800 turned it over curiously. No weapon had ever been taken before on a tour.

"What is this?"

Kels explained.

Milak's brow contracted. "We do not permit tourists to carry lethal weapons."

"I am on the same mission you are on," Kels said calmly. "I am employed by the World Council of 2124 to prevent any smuggling defiance of your laws."

Milak smiled down with benign irony.

"Have you been successful, my friend?"

"Not yet," Kels acknowledged. "But I usually get my man."

● HE was out in the timedrome now, a superb creation of lustrous glazed brick in shifting, shimmering colors. The party was waiting impatiently for him to emerge; Bolton had marshaled them in some sort of order, and they were flanked by the six giant guards.

Kels attached himself silently to the throng; he must keep his wits about him now. This would be the supreme chance for the smuggler to slip a sheaf of papers to some citizen of the age who might brush by the party in their wanderings.

They were out of the drome and in the heart of a great city. Little ecstatic cries from the women; more manly grunts of admiration from the men. It was a city such as pervaded the dreams of poets and the visions of colorists.

On every hand stretched glowing parks, riotous with fantastic blooms and iridescent fountains. Well spaced, and open to the cleansing winds of heaven, were softly curving structures, gloriously proportioned, of lustrous glazed tile, harmonious to the eye in infinite gradations of jeweled colors. They were not large, these buildings, the hand-fashioned tile unsupported by gaunt steel beams did not permit height, but the angularities and arrogant spires of early New York seemed somehow crude against this glowing city. Even the Parthenon and Taj Mahal paled to the commonplace.

Bolton was talking; a little rapidly, as though his breath were short.

"There is no doubt that 4800 has attained unbelievable heights in its development of the handicrafts. These structures that you see, the beautiful simplicity of their interiors, the superbly equipped private dwellings, the irrigation canals even, are products of hand labor and such tools as could be fashioned without power machinery. The culture of the age is of an extraordinarily high order; before its knowledge ours pales to elementary gropings.

"Yet in spite of everything, these people must work all their lives, a minimum of six hours daily. And it is toil of their hands too; physical labor as well as cunning of brain. The World Council claims that it is only by pitting brawn and mental equipment against the resistant forces of nature that the present generation of men has achieved its high development of body and mind. Perhaps! But it does seem a pity not to utilize those very forces of nature to slave for them, to perform the menial tasks of life and leave them free to enjoy the fruits of leisure."

Milak looked down with grave reproof at the flushed tour leader. "Methinks you have been warned on prior tours, John Bolton, against such subversive talk."

Bolton held his peace thereafter. He seemed oddly excited. The party was moving through an extensive park now. The ground was soft underfoot and the fountains musical. A building of Byzantine design, shading from aquamarine to a pale lavender, loomed directly ahead. This was the Museum of Fine Arts. A Rembrandt, "The Lady with the Pink," and a Cezanne, "The Bather," were priceless treasures there; all that were left of the artistic genius of the world to the year 2000. All else had been destroyed in the era of readjustment after the smashing of the machines.

A gently sloping ramp, flanked on either side by close-woven giant blooms, led up to the portals. Milak was in the lead, Bolton a little behind him, eyes restlessly moving from right to left. A few paces in back came the main body of the time-travelers, disorderly, chattering, laugh-

ing. On either side marched three soldiers, huge, silent, gently but firmly detouring denizens of their own time who chanced to pass the pilgrims. Kels straggled a little to the rear, his mild speculative eyes roaming over the individual members of the party. He was sorely puzzled, but alert.

CHAPTER IV
An Intrigue Exposed!

● A PARTICULARLY gorgeous bloom in the dense thicket of flowers caught his eye. It was swaying slightly. But there was no wind; the air was warm and breathless.

The tall interlaced blooms swayed violently. The air was thick with whirring sounds. Tiny needled flashes sped through the sunlight.

Four of the soldier guard fell transfixed at the first onslaught. Placid old Hardscrabble opened his mouth slowly in foolish astonishment, clapped his hand to his heart, and pitched headlong. One of the giggling sisters would never find source for merriment in the humorous spectacle of the world any more; she sprawled awkwardly on the ground, a thin trickle of blood oozing out of pale set lips.

Panic swept the affrighted tourists into a mad scramble from the invisible attack. Screams and groans rent the air. The pleasant place was a shambles.

Milak had stopped short, gave unhurried, swift commands. He had no weapon. The two surviving soldiers faced the thicket bravely, contracted their chest muscles. The strapped disks shot fort an unending stream of arrows. Then they went down, literally riddled with a cross fire. Milak started forward, toppled slowly.

The remnants of the tourists were flying dots on the parkland. Only Bolton remained to the fore, as if rooted to the earth; Melius and Pennyfeather crouched to one side, and the motionless figures on the ground who would never rise again.

The thicket on either side disgorged giant men, each with the deadly arrow diskoid strapped to his chest. They swarmed around Bolton, lifted him bodily.

Then Kels went into action. His dynol pistol flamed redly, spraying the group with tiny dynol pellets.

The men of 4800 went down as though a huge scythe had swept their ranks. Bolton, struggling in their midst, cried out in sudden anguish. Kels lowered his weapon, not daring to shoot again for fear of hitting the tour leader. Then he dropped flat, suddenly. Some of the outlaws had faced around, the sun gleaming on the arrow catapults.

A whiz of tiny arrows ruffled his hair with the wind of their flight. Melius and Pennyfeather dived headlong into the thicket and were lost to sight. Kels jerked his pistol around, aimed high, and pressed the trigger. The attackers toppled. Kels sprang to his feet, just in time to hear a crashing among the tall stalks. Bolton was gone, so were his kidnappers; dead and dying littered the place.

Milak rose slowly, blood spurting from a shoulder. His face was terrible in its calm wrath.

"I did not think the discontented ones would slay to attain their ends. What have they done?"

"They have kidnapped John Bolton."

"To force him to describe the construction of machines, no doubt."

"But he is not a technician or an engineer," said Kels. "He could not help them much. Melius or Pennyfeather were their men, if that was their purpose."

"What are you going to do?" Kels asked.

"Follow them," the man of 4800 said briefly. "You proceed to the Museum and inform the custodian. He will notify the World Council."

Kels shook his head in negation.

"Certainly not. I shall accompany you. My weapon," he stared wryly at the fallen figures of the malcontents, "is rather efficacious, and Bolton—well—he is a man from my own time."

"Very well," the other assented, "you may follow."

They plunged through the thick interlacing blooms, out on the other side where open parkland stretched for half a mile before meeting any obstruction. The kidnappers and their prey had vanished as completely as if the earth had swallowed them.

Milak smiled grimly at Kels' look of bewilderment.

"They have turned their penetration rays on each other," he explained. "It is this," he pointed to the mirror on his breast, the mirror he had used in searching the tourists. "The rays render them semi-transparent; at a distance of fifty feet and in bright sunlight it is almost impossible to see the dim, wavering outlines."

"Then how shall we trace them?"

Milak went grim. "The World Council has not been idle. We have learned a good bit about their plots. Their Headquarters are known to us; no doubt that is where they are taking Bolton, Come!"

He pushed on rapidly, his giant strides leaving Kels laboring behind. He pulled up at that and adjusted his pace to that of the smaller man. Twenty minutes of fast walking brought them across the level parkland, past the first series of glazed tile buildings. Then Milak stopped. A tiny inconspicuous structure, uncolored, crude in design and workmanship, nestled in a little hollow. The flat roof was almost level with the surrounding terrain.

"We shall have to adopt the tactics of the enemy," said Milak. He plunged his hand into his tunic pocket, brought out a penetration mirror similar to the one on his breast. This he affixed to Kels' left arm. Then he swerved his own to his right arm, so that as they stood side by side the two mirrors faced each other. He leaned over, adjusted a tiny switch on Kels' mirror, did the same to his own.

Milak suddenly became a thin outlined patch of misty radiance. The arrow catapult was a floating darkness. Kels glanced down at himself and saw that he too was a ghostlike wraith.

"Be sure to keep the mirror turned full on me as we walk," a voice came startlingly out of thin air. "Otherwise we shall be discovered and the alarm given."

● TWO faint outlines of mist crept soundlessly over the sod toward the little depression housing the headquarters of the conspirators.

"We could of course wait for help from the Council," Milak whispered, "but by the time it arrives Bolton may have been tortured into divulging whatever he knows about power machinery. Even sketchy information might be turned to use by the dissidents. They have some extremely able men among them, but unwilling to engage in honest labor."

Kels said nothing; his mind was busy with the puzzle. Why had Bolton, who knew absolutely nothing about machines, been kidnapped, when Melius—. Ah, there was the rub! Melius had disappeared, he remembered suddenly, and with him, Pennyfeather!

They had come to the edge of the hollow. Kels stared down. The house of the conspirators was a low two-storied affair, the edge of the roof some six feet above them and not more than ten to twelve feet away from where they stood.

"It will be easy for me to jump to the roof," Milak said. "Can you make it?"

"Yes." Kels religiously kept himself in good physical trim.

Kels took a few paces back, got himself a good running start, and sprang for his objective. His agile fingers slithered a moment over the smooth edge, gripped, and a heave of his shoulders and upward swing of his legs brought him panting slightly to the roof. Milak and he were plainly visible now; the strapped mirrors on their arms had naturally swerved from their objectives.

Milak clicked the switches. "They have achieved their purpose," he said. "Follow me."

Very careful not to make any noise, the man of 4800 and the man of 2124 crept side by side to the farther edge of the roof. Milak peered down, then grasped the edge with powerful hands and swung himself down. Kels followed unhesitatingly.

He found himself on a narrow slippery tiled ledge running completely around the house. A window showed directly in front of him, flush with the wall, and of thick crystal. Kels, pressing close to the wall on his precarious perch, could see no way to open it. But Milak calmly shouldered him to one side, pressed his great chest against the crystal and contracted his muscles.

An arrow flashed out of the catapult with terrific force. There was a tiny rending sound and the missile was through the crystal and had embedded itself in the farther wall of the interior. Milak went about it very methodically. He crouched lower and lower, an inch at a time, and arrow after arrow hurled itself through the thick glass. Then across at the bottom up at the other end, and back again at the top.

Kels caught the great cut oblong of crystal just as it was about to fall. Milak helped him ease it sideways into the room. Then the two men stepped in.

The room was evidently a sleeping quarters for quite a company. Inset beds, something like Pullman berths, lined the walls. Tunics of flaming colors were scattered recklessly over the two couches; other articles of clothing showed the exclusiveness of masculine occupancy.

Milak beckoned Kels with a warning finger. A faint light streamed upward through the floor in the corner to the right. They got down on hands and knees and peered down through a heavy crystal port. An amazing scene disclosed itself to their astonished eyes.

A dozen men of 4800, clad in green and scarlet tunics, were clustered around a slighter figure. The center of commotion was removing his clothes, or having them removed for him, it was hard to tell which. Then the group opened, and John Bolton, naked as the day he was born, his white body gleaming, walked calmly through a hasty lane of gesticulating giants, down to—a pool!

He paused a moment on the rim of a circular basin some ten feet in diameter, set in the floor of the chamber, its greenish liquid placid and inviting.

The men of 4800 mouthed back at him, urged him in with unmistakable gestures.

"Are they crazy?" Milak asked in amazement.

But Kels knew. The whole plot burst upon him in a single dazzling flare. He cursed himself under his breath for an idiot in not anticipating something like this. Cunning; devilishly cunning!

He was on his feet in an instant.

"Milak," he said rapidly, "we must stop it; stop it at once. Bolton must not enter that pool!"

Eltor Milak stared down at him thoughtfully, then nodded his head. "I do not quite understand, but you are right. There is method in back of these ablutions. Stand on the crystal oval—and be prepared."

The men below were intent on their naked victim still hesitant at the brim, when a new factor injected itself into the situation. Kels and Milak were on the oval; Milak was reaching out with a gigantic foot to press a knob on the outer encircling floor, when a door beneath slid violently open, and two figures almost tumbled into the midst of the conspirators.

● MILAK'S foot checked in mid air, and Kels exclaimed in exasperation. The two figures recovered their balance, advanced rapidly on the startled malcontents. They waved their arms and shouted soundlessly. Melius and Pennyfeather!

Bolton glanced hastily at them and dived headlong into the pool. At the same time the men of 4800 swerved on the rash pair, catapults gleaming wickedly on their chests.

Melius rumbled something in his throat; his poised foot descended. The crystal oval gave way suddenly beneath them; dropped swiftly into the room below.

The face of Melius was a terrible mask of wrath; Kels crouched grimly on his precarious perch, dynol pistol in hand; tensed for instant action.

The sudden descent of the crystal elevator saved the intruders' lives. Bodies swerved around, and the arrow flight whizzed harmlessly to one side.

Milak roared out a great forgotten battle shout; the muscles on his mighty chest rippled in lightning movement. Tiny arrows hurtled in unending stream among the disconcerted conspirators. The gun in Kels' hand flamed deadly dynol pellets.

It was slaughter rather than fair fight. The conspirators had been caught off balance. Before they could recover their wits, only three were left alive in that horrible hail of missiles. Two turned bravely to fight back and were mowed down. The third dashing swiftly through the open door, was lost to view.

Milak stared at the shambles with grave pitying eyes. The battle lust had quit him.

"Fools," he said. "They have found the slothful ease they sought so long." Then he turned to the cowering figure of Bolton, half submerged in the green-tinged pool.

"Come out, John Bolton," he urged graciously. "It is but an ill welcome you received in our time, and a curious one. I wonder—"

But Kels' sharp eyes had noted the strange darkenings on Bolton's white skin where the liquid of the pool was acting.

"Quick," he shouted rapidly to Melius and Pennyfeather, who were staring from behind a sheltering couch with stricken eyes, "pull him out of the water and bundle his clothes on him before he dies of cold."

The temperature in the room was extremely mild, but Kels' energy and lightning actions left no opportunity for wonder. He darted forward, leaned over, grabbed the unfortunate Bolton by the shoulders. The man was actually

white of face and chattering, as if in confirmation of Kels' diagnosis.

As Melius and Pennyfeather, wits recovered, assisted him in dragging the tour leader out of the depths, Kels saw configurations, unmistakable in their meaning, forming on shoulders and chest.

He thrust Bolton rudely in the midst of the three men of 2124, hustled him over to where his pile of clothes lay on the floor. Milak, from a distance, watched with puzzled eyes, but Melius was grinning sardonically as he shielded Bolton with his own clad figure. He *knew* too.

The bewildered Hook's man was hustled into his clothes like any child. Only when the last item of habiliments hid the damning traceries did Kels breathe a sigh of relief.

"Not a word, you idiot," he whispered fiercely, "if you wish to remain alive."

Bolton nodded dumbly.

Milak was thoughtful. "Now why, my friend, did these misguided men of my time kidnap you, and thrust you in a bath? They were men of intelligence, all of them, not given to idle flummeries."

Kels spoke rapidly, to forestall Bolton. "No doubt they mistook him for Professor Melius here, who could have given extremely valuable information on power machinery. When he denied knowledge of what they desired they must have threatened him with slow drowning to make him yield."

Not very plausible, Kels reflected, but the best he could invent on the spur of the moment. Milak stared down at him with benign, reflective eyes that held the hint of a twinkle in them. Kels began to feel uncomfortable.

Then the twinkle broadened, and Milak inclined his head gravely. "You have very likely stumbled upon the correct explanation, friend Kels. You had better remove John Bolton to the timedrome, and take him back with you to your own era, before he is again mistaken for another, and subjected to more unnecessary baths."

They went silently back to the timedrome, escorted by a regiment of grim soldiers of the Council who had come upon the scene just seconds too late. Milak's word was accepted as final—he was evidently a man of great authority—and there was no difficulty in their re-entering the Time Express. Kels heaved a sigh of relief as the entrance-port slid shut. A thoroughly cowed and frightened batch of tourists were already on board. Three were missing, killed in the earlier melee; some half dozen carried wounds of the encounter. All were anxious to return to their own time as fast as the Express could vibrate.

Bolton, white and red by turns, breathing in gasps, set the switches. The Time Express vibrated into its long backward journey through time.

A man suddenly staggered screaming out of a stateroom in which he had lain hidden. Kels recognized him at once. It was the giant conspirator who had escaped from the house in the last battle. The year 4800 would prove unhealthy for him, and he had taken this desperate step of trying to hurl himself back in time to a haven of safety.

Even as the passengers watched, horror-stricken, his form faded before their eyes; the screams muted down to a thin piping, and the man vanished completely.

A half hour later, Kels was closeted in a tight locked stateroom with a badly shaken Bolton. Melius and Pennyfeather were also present.

"It is your good fortune," Kels was saying coldly, "that at the last moment a feeling of solidarity with men of my own time awoke within me. I could not turn you over to the justice of 4800, no matter how much you deserved it."

"It was very simple, and very clever," Kels explained. "It even fooled me. Bolton simply covered his entire body with complete plans and specifications of fundamental power machinery, together with the necessary mathematical and electrical formulae. He used invisible ink that dried and left no trace. It had all been arranged on his preceding tour. The kidnapping was to get him away from the guard and at the same time to make him appear an innocent party. The bath contained a chemical fluid that brought the configurations into bold relief. The conspirators would have had them copied, the ink then washed off, and Bolton would have returned with some wild goose story to account for his kidnapping."

Melius nodded sardonically, "I suspected something of the sort. You see, Bolton came to me before the trip, and inveigled all the data and plans out of me on promise of huge future rewards. That is why Pennyfeather, my assistant, and I kept a close watch on him. I always like to know the answer to puzzles. At the pretended kidnapping, we dived into the thicket, and noted the direction the party took before they disappeared into haze. Then we followed and came upon the house in the hollow."

Kels turned sternly upon Bolton. "Why did you lend yourself to such a dangerous scheme? What benefit could you possibly have deriven to justify it?"

Bolton straightened and shot back. "Gold! Lots of it!" he declared vehemently. "I hate the job I have; I hate mustering old men and retired butter and egg men into the future for interminable years, listening to their confounded twaddle, bearing with all their whims. I wanted leisure, power, luxuries, the right to do as I please. I needed money for that. On my last trip a guard whispered to me, told me what was wanted, promised me what would represent a fortune in gold in my own time. How can you blame me for taking the chance?"

"You unutterable fool," Kels said slowly. "Didn't you know; didn't you yourself as part of your patter to tourists say over and over, that *nothing* could be taken back in time? The gold, even if you had won through, would have vanished in exactly the same fashion as the man of 4800 who tried to return with us."

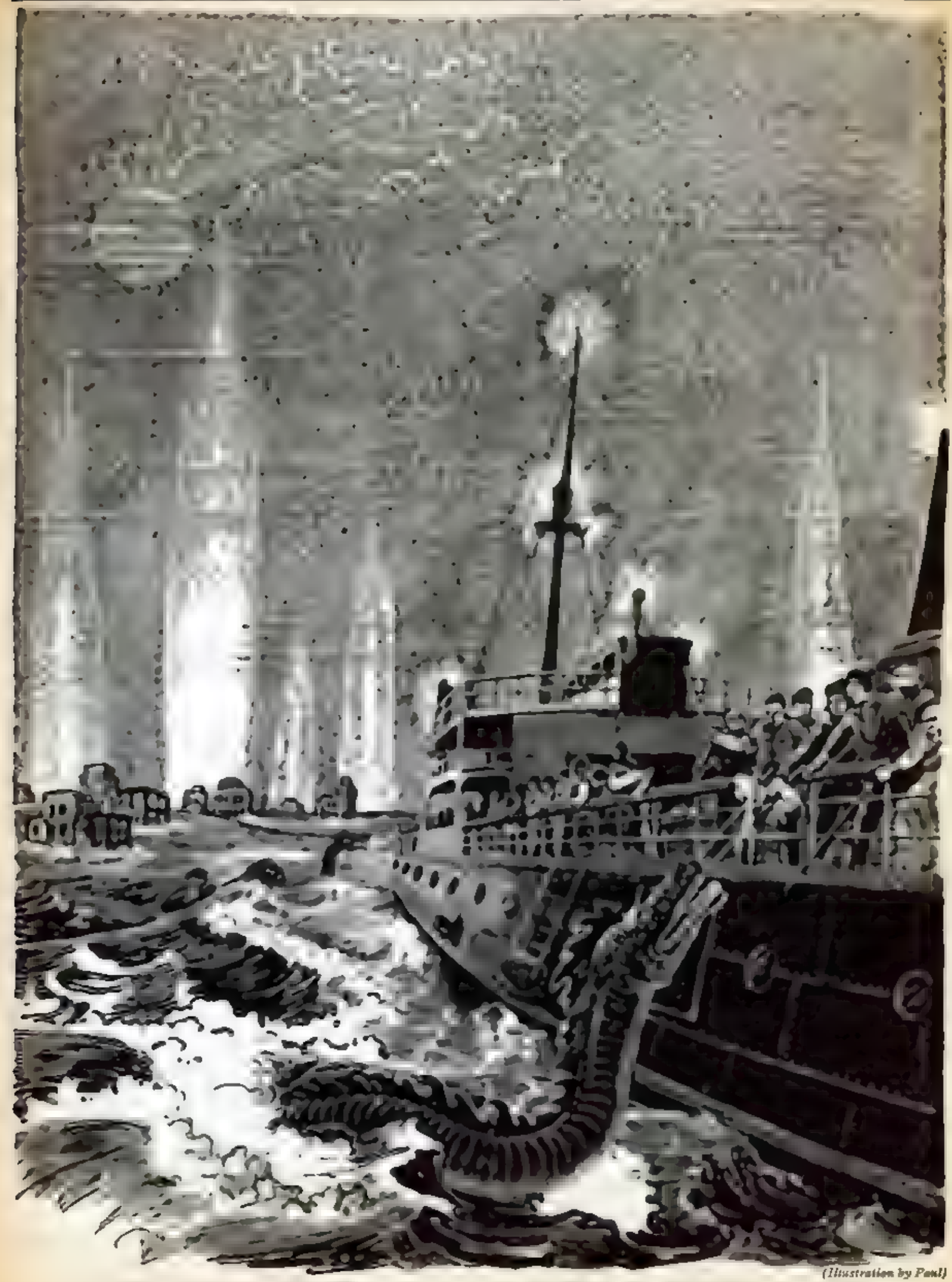
Bolton lifted a haggard despairing face, groaned once, dropped it back into his hands.

Melius grinned sheepishly.

"Don't be too hard on him. His tour lectures had become so much a matter of rote that he never heard the things he was saying. I myself," he grinned even more sheepishly, "fell into the same egregious error. I tried to obtain information about the atomic motors in the year 2850 for use in our own time. The atomic engineer at the power house very kindly disabused me."

Kels nodded absently. He was trying to figure out how he was going to word his report to the World Council of 2124.

THE END



(Illustration by Paul)

The river seemed to be filled with great snakes trying to climb up the sides of the vessel. Most of them fell back into the water.

THE PLANETOID OF DOOM

By Morrison Colladay

● We have been hearing much of late about newly discovered asteroids, tiny solar bodies, that are said to approach within a few million miles of the earth in their pilgrimages about the sun. These bodies thus become the earth's closest neighbors, aside from the sun.

Such wanderers of space bring us close to the unknown mysteries of the solar system . . . they bring with them strange things . . . dangers . . .

Coming close to the earth they might fall within the earth's gravitational grasp and vitally affect our lives and fortunes; they might provoke great disasters coming suddenly and without warning to a helpless earth.

This story shows in a thrilling way what might happen in such an event.

● Jim and I weren't feeling very cheerful. We were both out of a job, and that year it wasn't easy to pick up new ones. The supply boat from New Orleans had just left with our engineering crew. There were some odds and ends of work to finish up, and we were going to camp out on an old "gazzoleen" tub tied up in a bayou near the mouth of the Mississippi for the next couple of weeks. The mosquitoes were pretty bad, and we would have to cook our own meals; but our salaries would go on for that additional time, so things might have been worse.

We were both one year out of engineering school. We had been bossing a crew in the Louisiana marshes, spotting salt domes for one of the big oil companies. When you locate a salt dome in that part of the country, you can pretty nearly figure that there is oil underneath. Finding the salt domes is easy enough by present day methods. You set off dynamite charges in the ground at measured distances from a central point, and then time the arrival of the vibrations. That's all there is to it, except making the necessary calculations from the data.

We had figured on our jobs lasting another year, and we thought we were sitting pretty. The corporation furnished food and shelter for its employees and there was no way of spending money down there in the swamps, so we saved most of our salaries. Then the oil market went blooey and headquarters began to cut expenses. At least we got our two weeks' notice, and that's more than a good many others got.

The "gazzoleen" was tied up to the dock in front of the deserted corrugated iron warehouse. Beyond were several shacks on stilts, in which the men had lived. It seemed pretty lonely after having a gang around for nine months. Jim was polishing up a theodolite while I read whatever looked interesting in the bunch of New Orleans newspapers the supply boat had left. After you get used to doing without papers, they don't seem as important as when they come to you a couple of times a day.

I saw the headline in the New Orleans *States*—"Planetoid to Approach close to Earth," but it didn't excite me. I can't get a copy of the paper, but the account went something like this:

"A new planetoid has been discovered with a parabolic orbit which will probably bring it closer to the earth than any heavenly body has hitherto come. It is traveling at such great speed that astronomers have so far found it difficult to accurately chart its course." There was more of it, but that was the important part.

"Hope it doesn't hit us during the next two weeks," said Jim. "This would be a swell place in a tidal wave, I don't think!"

Isolated as we were, we heard nothing more about the planetoid until the night it fell into the Gulf of Mexico somewhere on a line between Yucatan and the mouth of the Mississippi river. People in the rest of the world where there were daily newspapers were told of its rapid approach toward the earth. I judge efforts were made not to alarm them more than was necessary, but as the thirteenth of June approached, they were prepared for something to happen. Of course, we were not.

It was just our good luck that the old "gazzoleen" tub we were living in was built so she was practically unsinkable. Some humorist had painted the name *Gazelle* on her stern. She was about thirty feet long, eight feet beam, and built as heavily as a scow. There was a deckhouse forward where Jim and I slept. The engine was in the stern, bolted to a deck of extra heavy planking reinforced with iron. The hull could be entered through only one hatchway flush with the deck. Below, forward, was a compartment for the more valuable tools and equipment, aft, was another compartment for dynamite. Now both of these were empty, the stuff they contained having been transferred to the supply boat.

When the hatchway was closed, about the only thing that could have sunk the old tub was the dynamite, should it go off. A hurricane or a tidal wave might sweep away the light deckhouse and even tear loose the exposed engine, but anyone below would be safe, unless he smothered to death. If the *Gazelle* had been built like an ordinary boat, Jim and I would have been fish food on the thirteenth of June, like most of the other inhabitants of the southeastern part of the United States.

● It was not long after the discovery of the planetoid that astronomers decided it was likely to hit the earth. They were unable to agree as to the probable effects of the collision because of the unknown factors of size, speed at

moment of contact, and whether point of contact would be a continent or an ocean. There was general agreement that the visitor was small as planetoids go—not more than ten miles in diameter and possibly not more than five. It was also generally agreed that the collision would occur somewhere within the tropics.

One astronomer predicted that "the air and water at the point of contact would be instantly consumed and dissipated and a considerable region of the earth's surface raised to incandescence. It might happen that diffusion of noxious gases from sudden combustion of hydro-carbon compounds would so vitiate the atmosphere as to render it unsuitable for breathing." Another asserted that the entrance into the atmosphere of an object traveling at the high speed of the planetoid must cause air waves so powerful as to produce all the effects of a disastrous earthquake.

The newspapers republished accounts of the fall, in 1908, of a great meteorite in Yenesei Province in Central Siberia. This meteorite was supposed to have weighed not more than a hundred and forty tons, yet it devastated hundreds of square miles of country.

It was one o'clock in the morning of June thirteenth that the planetoid hit the earth. We had gone to bed, but it was too hot to sleep even though we had brought our army cots out on deck. We were lying there smoking and talking about what we were going to do when we got away from the salt marshes and the mosquitoes and the loneliness. . . .

Suddenly a wave of green light flashed up from the western horizon and spread across the sky. We tumbled from our cots in less time than it takes to tell about it. I noticed that the unearthly color made Jim look like a corpse with purple lips and holes for eyes. It must have been only a fraction of a second until a great incandescent green sphere shot into view.

It rushed across the sky, growing larger as it approached until it looked four times the size of the sun. Behind it swept a fan-like green tail. Then as we watched it, the sphere seemed to expand instantaneously in a tremendous explosion, and the whole sky became a blazing furnace. The shock threw me violently to the deck.

Jim shouted at me, but my ears were ringing so I could not understand him. He saw that I was half dazed and dragged me below. He had just succeeded in fastening down the hatch cover when we heard the shriek of the oncoming wind. There was a crash and the boat turned halfway over. Jim was flung down on top of me and a second later we were both thrown against the side.

"That was the warehouse," Jim shouted above the tumult outside.

There was another interval of seconds before the tidal wave reached us. We heard a new sound above the roar of the wind, and then there was plenty of action for a few minutes. Comparing impressions afterwards, we decided that the tidal wave must have swept the wreckage of the warehouse away and then rolled the *Gazelle* over several times, finally leaving her right side up, fortunately for us.

We were pretty badly bruised by the time the more violent motion subsided. It was evident that the boat was being swept to some unknown destination at immense speed. However, we were afloat and neither of us had any bones broken. We concluded that there was nothing for us to do except wait until we stranded somewhere. We made ourselves as comfortable as possible in the darkness and finally I fell asleep.

I was wakened by a sudden jar and realized that we were no longer moving.

"I guess we're aground," I said.

"Feels like it," answered Jim. "The water's going down. The boat's beginning to tip."

We waited an hour before we took a chance on opening the hatch. By that time the *Gazelle* was lying on her side as if she had been hauled up on shore. We were almost too stiff to walk when we climbed out and got the first glimpse of our extraordinary surroundings.

Extending as far as we could see was a lake of troubled water of a peculiar greenish color, from which rose great buildings. In a moment I realized that we had been swept a hundred miles inland and that we were gazing over a submerged New Orleans. I knew the business section of the city fairly well and I saw that the *Gazelle* had landed on the roof of the Federal Reserve Bank, one of the lower buildings surrounded by skyscrapers.

The water was now receding rapidly. Though it was still dark except for a pale moon, it seemed curious that we saw no people and that there were no lights in the buildings. Nobody could sleep through what had happened that night, and New Orleans was a city of nearly half a million.

Jim and I stared at each other. "Where do you suppose all the people are?" I asked.

"Drowned in bed, most of them, I guess. They're keeping awfully quiet if they're alive."

I realized then that one of the things that made the scene so ghostly was the absolute silence. There was not a sound except an occasional gurgle from the retreating water. We stood for fifteen minutes at the edge of the roof, watching for some sign of life.

"No use waiting here, doing nothing," said Jim at last. "We'd better go after help."

"We can't unless we find another boat," I answered. "It'll be flooded here for weeks with the drainage pumps out of commission. All of this country is from ten to twenty feet lower than the river. There's no place for the water to go."

We reasoned that there was a good chance of finding a usable boat along the docks. We solved the problem of getting there by putting together a raft of partitions and office furniture from an adjoining building, which we entered through a smashed skylight. The distance to the docks wasn't great and both of us were strong swimmers, but there was something extremely unpleasant-looking about that green water. It wasn't as it became twenty-four hours later, but even now it looked slimy and iridescent and seemed to be in constant motion as though it were full of crawling things.

When we paddled our raft down Canal Street we had no idea of danger. Even when the piece of a door frame I was using for an oar was suddenly seized and dragged from my hands, we thought an alligator washed into the city from the swamps was being playful.

Jim sculled the craft to the ramp which led to the ferry house at the foot of Canal Street. We climbed over the railing and waded through a couple of feet of water which still covered the floor into the waiting room. Here was a scene of desolation, and two or three bodies—the first we had seen.

The two-decker ferryboat had sunk in her slip, but the pilot house and hurricane deck were now above water. One of the two lifeboats was smashed to kindling, but the

other was serviceable after we had bailed it out with fire buckets.

CHAPTER II

Down the Swollen River

● We pushed the lifeboat over the side and started down the river with one pair of oars which I found in the pilot house. In that current oars were not of much use except to steer. The Mississippi was swollen by the water draining from thousands of square miles of the valley inundated by the tidal wave. We swept past the city docks, keeping our eyes open for a launch with a serviceable motor. Apparently none of the hundred or so vessels tied up at the docks or anchored in the river had escaped disaster. We could see the masts and superstructures of those sunk in the comparatively shallow water near shore.

It was not a cheerful scene. The flood was carrying toward the sea the wreckage of hundreds of towns as well as countless bodies of human beings and animals.

We floated down to Belle Chasse before we found what we wanted. There at the docks used by the Seatrain, a ferry which carried loaded freight cars to Cuba, we found on a gondola a thirty-foot cabin launch with the engines of a rum runner. It had been carefully loaded for shipment and was undamaged by the tidal wave. Not a drop of water had penetrated to the cabin or hull.

With the equipment at the dock it was a simple job to get the boat into the water. Her gasoline tanks were empty, of course, but we found gas pumps above water, so that was soon remedied. We broke into freight cars until we had secured enough supplies of every imaginable kind to last several weeks. One of the most important things we came pretty near forgetting altogether. I thought about it just as we were getting ready to cast off for our trip up the river.

"Water!" I exclaimed. "What are we going to drink?"

"Gosh, I never thought of that," said Jim, frowning. "We certainly can't drink this green stuff. It's beginning to smell worse than sewage, and the Lord knows what it tastes like."

We spent another hour breaking into more freight cars before we came across a shipment of bottled water.

It was beginning to grow dark, and if we had been sensible we would have stayed where we were until morning. But we were both anxious to get started after help. It seemed hardly possible that a city of five hundred thousand people could be wiped out by any catastrophe without leaving some survivors.

By this time the river had fallen below the tops of the levees. Back of the levees the country was covered with a stagnant green lake about twelve or fifteen feet deep, from which the upper stories of buildings that had not been washed away projected. During the entire day we had seen no sign of another human being.

Just as we started the engine, three planes appeared in the sky. As we chugged away upstream they saw us.

"Must be trying to signal," said Jim as they dipped and circled around.

We watched, but we couldn't make out what they wanted, if they were really trying to signal us. Presently they winged away toward the north.

It was when it grew dark that we got the first sight of the curious phenomenon which has puzzled scientists as much as anything connected with the destruction of the planetoid. Against the darkness a delicate shimmer of iridescent green flame seemed to rise from the water for about ten feet. It wasn't flame, of course, for we were surrounded by it and the temperature remained constant. We sailed in a sea of this palpitating green light, extending as far as we could see in every direction. When we approached downtown New Orleans the buildings in the business section stood out against a blue-black sky, bathed in pale green radiance.

● We reached the foot of Canal Street and tied up the launch at the concrete steps which descend from the top of the levee to the river. This is where the pleasure boats used to take on their passengers. Beyond lay the coffee dock, usually lined with vessels from all parts of the world. Tonight they were resting on the bottom of the river. We could see their masts and smokestacks by the greenish flames which played over the surface of the water.

At the foot of Canal Street the land gradually rises for two blocks until it reaches the height of the levee, forming an elevated plaza paved with concrete, which was now above water. Jim and I stood at the edge of the plaza looking down the green lake which two days before the city had boasted was the widest and best lighted street in the world.

There seemed to be nothing we could do at least until daylight. We were turning away when Jim caught a glimpse of the boys.

"I see somebody!" he exclaimed excitedly. "Look—that second-floor window of the Custom House."

"Where?" I asked, staring at the immense granite building two blocks away with its multitude of windows.

"Look where I'm pointing—the second window from the corner on the second floor. There's two of them, two boys."

Now I saw them. They were sitting on the window sill, apparently planning to jump into the water a few feet below and swim to us.

"I guess they'll make it all right," said Jim a little doubtfully. "It isn't much of a swim."

As he spoke, one of the boys lowered himself into the water. He struck out strongly and had nearly reached the buildings on the opposite side of North Peters Street when suddenly he began to scream.

We saw that the water all around him was in violent commotion. He was struggling and his screams became shriller. Then something pulled him under and he didn't come up again.

Jim and I looked at each other with white faces—at least, I saw his was white and I felt sick enough.

"Stay where you are!" we yelled to the other boy who was still perched on the window ledge.

"It was all over so quick we couldn't do anything," I said. "Suppose it was an alligator?"

Jim shrugged his shoulders. "Might have been. Maybe a big gar. You can't tell what's been washed up from the bottom of the Gulf of Mexico. We'll have to go after that other boy."

We found a life raft on the Bienville Street dock. It wasn't very heavy and we dragged it down to the flooded street. The boy was still crouched on the sill of the second-floor Custom House window. Of the other boy there was no sign when we passed the corner where he had disappeared.

He was a very frightened youngster when we reached him. The raft was about eight feet below the window ledge on which he was perched and he was afraid to lower himself so I could get hold of him.

"Gee, suppose I fall in?" he said.

"You won't," I assured him. "I'll catch you."

A life raft looked pretty flimsy to him, I guess, after what had happened. Finally we got him down safely and started back the way we had come.

We had gone a little more than half the distance back to the plaza when the raft gave a sudden lurch and then righted itself. If it had been a boat it probably would have overturned. The boy yelled and I whirled around just as an appalling-looking creature reared itself out of the water.

The part that was visible was like a huge snake a foot in diameter and six feet long, terminating in a head which was nearly all mouth filled with wicked-looking teeth. This head darted toward the boy. I struck at it with my paddle, but that bounced off the rubber-like, muscular neck.

Jim whipped out his forty-five automatic and let go all the shots in the magazine. A body big around as a barrel leaped convulsively out of the water and then fell back. It was immediately the center of a swirling commotion. Other sharp-pointed jaws with razor-sharp teeth were tearing it to pieces.

We poled the raft along close to the buildings and got back to the plaza before the spotted morays—which is what we were afterward told they were—turned their attention to us again.

● After he had had something to eat, the boy told us his story. His name was Joe Waters and he was fifteen years old. He had run away from his home in Columbus, Ohio, to see the world and had got stranded in New Orleans when he couldn't find a job. The boy who was drowned was a chance acquaintance who had taught him how it was possible to live without money.

The two of them had escaped from the tidal wave by the merest accident. The fourth floor of the Custom House, erected back in 1840 or thereabouts, had never been completed inside. It was a good place to sleep, except for lack of light and air, if the boys could dodge the watchmen on the lower floors. After they reached the unused stairway—through a hole in the wire netting which was supposed to keep intruders away—there was no one to disturb them.

The night of the tidal wave they were sleeping in this place, and while the three lower floors of the building were flooded, very little water penetrated to the tightly closed fourth floor. They were wakened by the noise, but were too frightened to try to get away until the following night. They had nothing to eat and they were starting on a foraging expedition when we first saw them climbing out of a window. They thought that the water had gone down enough for them to swim or wade to one of the small restaurants in the next block. Joe was about to follow the other boy into the water when he saw the ferocious head of a moray appear above the surface. He thought it must be an alligator and shouted a warning. The swimmer glanced over his shoulder and evidently figured he could make the buildings on the opposite side of the street, for he kept on. He was within a few feet of safety when he was pulled under.

"There was hundreds of 'em," said Joe, "and they just et him up alive!"

We began our night journey up the flooded and lightless Mississippi with Jim at the wheel and me nursing the engine. We expected, each time we rounded a bend, to meet rescue vessels on their way to New Orleans. When daylight came without our seeing anything afloat on the river except our own boat, we began to realize that the catastrophe had been much greater and more widespread than we had imagined.

"Funny the government hasn't sent help," I said as the morning wore on.

"Sent it from where?" asked Jim. "For all we know, every boat this side of St. Louis was sunk."

It wasn't until we reached Natchez, two hundred miles from New Orleans, that we saw any signs of life. Natchez proper is situated on a high bluff. Natchez-Under-the-Hill had been gradually falling into the river for years, and the tidal wave completed its destruction. We tied up to the remains of a dock and in a few minutes were in touch with the outside world again.

The low-lying regions around the city had suffered the fate of the rest of the lower valley. Cellars and ground floors of buildings had been flooded and that was about the extent of the damage. We were the first to bring news from the south and our arrival caused a good deal of excitement. All telegraph lines were down, but there was a local radio station and the rest of the world had been inquiring frantically for news of New Orleans.

The newspaper men took charge of us for the next few hours. A flash was sent out telling of our arrival and the news we brought of the destruction of life in the lower valley. Preparations for a relief expedition were under way a few minutes afterward. Memphis, three hundred miles from Natchez, was the nearest point from which it could start. The United States Engineering District headquarters had a number of vessels there, used in levee work, which had been battered about considerably but which were perfectly serviceable. They were quickly loaded with supplies. Within two hours after we landed at Natchez they were on their way down the river with a hastily gathered corps of doctors and nurses, and troops for police duty.

Before long, news reached Natchez from Washington that the Red Cross would take charge of the New Orleans situation. After we had answered all the questions of the newspaper men, we tried to find out what had happened to the rest of the world when the planetoid fell, but very little seemed to be known. The tidal wave had swept up the Mississippi valley as far as St. Louis, converting the low country behind the levees into great lakes. It came so suddenly that the inhabitants of the lower valley were unable to escape and most of them apparently had perished.

The water which flooded the upper part of the valley was not so heavily charged with the mysterious green substance, and the phosporescent flames which played over its surface were not so spectacular as they were in the New Orleans section. The river in front of Natchez was rapidly assuming its normal yellow shade.

No word had been received from Florida and the lower Atlantic coast region. Even before we brought the tragic news, the gravest fears had been felt for the low-lying Gulf states as well as for Mexico, Yucatan, Central America, the Canal Zone, the northern coast of South America and the

islands of the Caribbean Sea. All cables were out of commission and it had been impossible to get any response from radio stations in this territory.

CHAPTER III

From the Sea's Depths

● Jim and I went aboard the *General Pershing*, the first of the rescue vessels to arrive at Natchez the next day. The *General Pershing* was one of the awkward-looking, three-story-hotel constructions used by the United States engineers in their levee operations. It would accommodate, in a pinch, a couple of thousand persons, I imagine.

When we looked back, after we had started down the river, we could see following us a procession of boats and barges, all part of the rescue fleet.

We discovered that the greenish flood water contained more dangerous inhabitants than spotted morays. We were opposite Kenner, a small town a few miles from New Orleans, and we were eating lunch when we heard a commotion on the upper deck. Mississippi boats of the type of the *General Pershing* are built with the lower decks almost entirely enclosed. No space is wasted on passages outside the staterooms, the windows of which look directly over the water.

At first we paid no attention to the noise, but suddenly a man began screaming. Jim and I and most of the others at the tables rushed up the stairs. By the time we reached the upper deck the man was dying.

We crowded around while a couple of physicians worked over him. In a minute or two his writhing stopped. The distorted face, lips drawn back halfway to the ears, swollen tongue thrust between the exposed teeth, eyes protruding from their sockets as if they were about to pop out, became rigid.

"He's gone," said one of the doctors as he released his grasp of the victim's arms, while the other put his hypodermic away. Suddenly it dawned on me that I'd never seen anything at all like the ten foot greenish snake lying on the deck with its head mashed to pulp. One of the officers moved its thick body with his foot.

"What is it?" I asked him.

"A sea snake," he answered. "Never saw one before, except in the Indian Ocean. Deadly as a cobra. Sometimes the water there is full of them. Don't know as I ever saw one as big as this fellow, though. We seem to have run into a lot of them."

I noticed for the first time that around the rail, about a dozen feet apart, were men armed with clubs. Every few seconds one of them would bend over the rail and strike at something.

"More of them trying to get aboard?" Jim asked.

The officer nodded. "Never knew them to try to board a ship before."

Jim gazed over the rail, then he turned and beckoned to me. "Pretty, isn't it?" he asked grimly. I looked down at the water. The river seemed to be full of snakes, trying to climb up the sides of the vessel like great worms. Most of them fell back into the water before they got very far and the others were beaten off by the sailors.

I wondered what was going to happen after it got too dark to see the snakes. I noticed Colonel Lounsbury, who was in charge of the expedition, in consultation with several of the engineers. Shortly afterward men began stringing rows of wire around the outside of the railing. When they had finished, notices were posted warning passengers that the wires would be heavily charged with electricity.

Presently the current was turned on and we leaned over the rail to watch the effect. The snakes seemed to be as thick as ever and not at all discouraged by the reception they had been getting. From where we were we could see eight or ten of them crawling up the side. All except three fell back into the water before they got far. The three kept on coming until they struck the four parallel wires. Then there was a flash accompanied by a little smoke.

"I guess that takes care of them," said Jim.

"Sure, but what are we going to do when we land?" I asked. "Suppose they're in New Orleans as they are here?"

"If they are," he said slowly, "there won't be much use landing anyway. That sailor died ten minutes after he was bitten."

Soon afterward we entered the crescent which the river forms around the city. Suddenly the odor of death and corruption swept over us in a great wave. It was so strong it made me gasp. Colonel Lounsbury summoned Jim and me to the pilot house.

"Did you see any of these sea snakes in New Orleans?" he asked.

We shook our heads. "Of course, we weren't looking for them," said Jim.

"They make the job we've got ahead of us a nasty one," said the Colonel. "No way of keeping them from attacking small boats, so far as I can see. Most of the city under water when you left—hadn't drained off much?"

"I don't believe it could drain off," I said. "Where could it drain to? The river and the lake are both higher than the city."

● Colonel Lounsbury nodded. "The only way, I guess, is to get the pumps going. I can't figure how we'll do it, unless we find some of the city engineers alive."

We were passing the blocks of white buildings along the levee comprising the Second District flood control base. They seemed intact, though the government vessels along the levee had been sunk. Colonel Lounsbury examined them through field glasses. His face was grim as he put the glasses away.

"See anyone?" I asked.

He shook his head. "No use landing there. If any of the boys were alive, they'd have signalled us."

There were no signs of life on shore as we continued on our way toward the foot of Canal Street, which was to be the base for whatever rescue operations were possible.

The other vessels following us down the river received their orders by radio. Thus they were able to prepare for the sea snakes before they were attacked. When we were a little above Canal Street we edged in beside the levee between the Algiers ferry and the coffee dock. Ordinarily there would have been room for several vessels our size at the concrete embankment, but now we had to avoid the sunken hulks with only their masts sticking out of the water.

Colonel Lounsbury radioed the vessels following us to anchor where they were and wait further orders. He wasted no time. Five minutes after we had tied up, a landing party of twelve, including Jim and me, started ashore.

The first thing I noticed was that the water in Canal Street had receded nearly to the Custom House. There was no wind and the smell of decay which hung over the city was almost overpowering. Scattered along the street where the receding water had left them were many human bodies and parts of bodies. Beyond the Custom House the green flood looked more unhealthy and repulsive than ever, though the phosphorescent flames were not visible in daylight.

Colonel Lounsbury scanned the city through his field glasses. "Looks bad," he said. "Still we've got to be certain. We'll get a couple of the lifeboats down here and see what we can find."

"What about the sea snakes?" asked one of the civilian members of the party.

"Well, what about them?"

"Suppose they attack the lifeboats?" persisted the man.

"It'll be damn unpleasant, but what of it? We've got to find out whether there's anybody alive in the city, and there isn't any other way." He looked at his watch. "Who wants to go along?"

Half an hour later, two of the ship's lifeboats were floating in the water-filled street. Those of us who were going piled in and we started out Canal Street, keeping a close watch for signs of life. We figured if there were any survivors, we would find them in the hotels or office buildings, the upper stories of which had been above the tidal wave.

Most of the principal hotels and big buildings were within a block or two of Canal Street. St. Charles Street and Royal Street, on opposite sides of Canal Street, were only two blocks away from where we launched the boats.

We turned up St. Charles toward the St. Charles Hotel, a red brick structure covering the block between Common and Gravier Streets. We found the lobby of the hotel was still flooded to a depth of six or seven feet. There was no way of getting through the doors except by swimming, and naturally no one was foolish enough to attempt that. Finally Jim and I climbed to the top of the glass portico which extended out from the main entrance. We pulled up after us Colonel Lounsbury, and Professor Ames who was in charge of the scientific end of the expedition. The rest of the party remained in the boats.

We made our way to the mezzanine floor of the building through a broken window. It was evident at first glance that the water had left no one alive in this part of the hotel. We found the same conditions as we climbed to floor after floor until we reached the topmost one. Here there was an especially strong odor of decay, and a moment later we saw why. Scattered around the corridors and rooms were curious-looking bodies. As we got a first glimpse of them from the head of the stairs, I for one was not sure they were human. As soon as I went closer I saw why. They were only parts of bodies. Most of the flesh had been torn from the bones.

"Gosh!" exclaimed Jim. "Something's been eating them!"

"Maybe it was the spotted morays again," suggested Colonel Lounsbury.

Professor Ames, who had been examining the bodies, shook his head. "Those people weren't killed in the water. You can tell that by the clothing. It looks to me as if they had escaped the tidal wave and were attacked afterward when they thought they were safe."

"What's that?" asked Jim suddenly.

● Shouts and yells were coming up from below. We rushed to the windows and saw the men we had left in the boats fighting with what at first I thought were a new kind of enormous sea snakes. They were fifty or sixty feet long, had red fins down their backs and heads like horses. Lifting themselves partly out of the water they seized whatever was nearest their huge jaws. Their teeth sheered through an oar as if it were made of paper. During the few seconds we were at the windows I saw one of them snap at a man who dodged and the jaws closed on the side of the boat. Unbelievable as it sounds, a semicircular piece was bitten out of the thick planking.

There seemed to be hundreds of writhing bodies outlined under the water by the red fins. Some of the men in the boats began to shoot while others tried to climb the portico supports to reach the mezzanine floor of the hotel, as we had done.

The four of us at the windows had been paralyzed with astonishment for the few seconds while this was going on. Then with one impulse we tore down the stairs. I'm not sure what we expected to do. There was no possible way of fighting the creatures. If we had reached the mezzanine floor in time we might have pulled some of the victims up to safety. As it was, when we climbed out on the portico and looked down, there was nothing in sight except the two empty boats and floating oars.

It was necessary for us to recover one of the boats to get back to the ship. There was no current in the flooded streets, so they had not drifted far away. First we tried fastening a couple of sash weights to the end of a rope and tossing the weights into the boat. Several times we thought we had succeeded and so we would if the weights had caught around one of the seats. Finally the professor suggested tying together a couple of the long poles they used in the hotel for raising and lowering windows. This did the work and we drew the boat up to the wall.

Meanwhile the horse-headed creatures, which Professor Ames called *regalecus glesne*, had disappeared and the water was quiet.

"Might as well take a chance now as later," said Colonel Lounsbury. "That suit the rest of you?"

We all assented.

"Let's go then," he said, lowering himself into the boat. We followed him. We fished four oars out of the water and rowed away from the neighborhood as quietly as possible. Instead of going back to Canal Street we turned into Common, which ran along one side of the hotel. Directly ahead of us and only three blocks away was the part of Canal Street which was above water, Common running into it at an angle.

CHAPTER IV
Stranded!

● We had almost reached this point of comparative safety when we saw the first of the animals which science has been entirely unable to account for. All of the other creatures that came with the green water were larger forms of species which were previously known. The creature that we now saw gazing at us from the roof of a low building fifty yards ahead was like nothing except the prehistoric monsters which scientists have labelled tyrannosaurs.

Professor Ames saw it first. "Stop!" he exclaimed. "Look up on that roof on the left, halfway down the block."

We stopped quickly enough when we saw what he was pointing to. Its body was partly concealed by adjoining buildings, but we saw enough not to want to go nearer. It looked like an alligator twenty or thirty feet long, with six or seven-foot rear legs built for jumping and tiny front legs. It had a tail that was a cross between an alligator's and a kangaroo's. The middle of its body was thicker than an alligator and the head larger. It was watching us as it crouched on the roof, ready to spring when we got near enough.

"Row backwards," said the Colonel, "and keep cool."

I don't suppose any of us felt very cool as the boat slowly backed until it reached Magazine Street. We were able to keep our eyes on the animal in front of us, but we hadn't any idea how many more there might be in the neighborhood.

"I'd swear it was a tyrannosaur," said Professor Ames, "if the species hadn't been extinct for millions of years."

The tyrannosaur, or whatever it was, didn't attempt to leap into the water and pursue us, as we figured it probably would. We decided afterward that it had been feeding on dead bodies until it was torpid. I suppose there is not much doubt that the only thing that saved us from the fate of the other members of the party was that the thousands of carnivorous creatures under and above water had been feeding until they were no longer hungry.

We turned up Magazine Street one block to Gravier and started to row again in the direction of the levee. We had reached South Peters Street when the boat struck an obstruction and stopped.

"We must be aground," said Jim, sticking his oar down into the water to measure its depth.

Suddenly the boat was lifted into the air as if it weighed no more than a feather. We were pitched sprawling into the green water as it overturned. I struggled to my feet and found that I had landed on the loading platform of a warehouse with the water not much above my knees. The Professor and the Colonel were also safe on the platform, but Jim was some distance away, swimming toward us.

A great slimy tentacle covered with sucking discs rose from the water and wrapped itself around the empty boat.

"Hurry, Jim!" I shouted, starting toward him.

"Keep back!" he yelled.

I saw another of the tentacles was reaching for him just under the surface. Fortunately there was a curved iron hook with a handle sticking in the top of a bale of cotton near me. I seized it and swung at the tentacle as it was closing around him. The sharp hook went right through the slimy cylinder and I was nearly dragged under before I could let go.

Jim caught hold of me and we backed up against the wall.

"Come this way!" I heard the Colonel shout.

I looked around and saw that he and Professor Ames were climbing an outside fire escape. We hurried toward them, but it isn't possible to make much speed through water even knee deep. However, we reached the fire escape safely and climbed to the third floor where the two men were waiting for us.

"Whew!" exclaimed the Colonel. "That was the narrowest squeeze yet. I thought Jim here was a goner and I wouldn't have given much for your chances either."

"But what was it?" I asked. "It looked like another of the snakes, only bigger, with suckers all over it."

He silently pointed to a building across the street and a little farther down. There in a double doorway were the bulbous body and enormous staring eyes of a great octopus. Several of its tentacles were partly out of water and they were at least forty feet long.

For the moment we were apparently safe. The eyes of the octopus remained fixed balefully, but it made no effort to come after us.

Our immediate problem was to reach the docks only a few hundred feet away, but there was still a stretch of the green water between, and now we had no boat. We made our way through a trapdoor to the roof of the building, carrying with us a coil of rope. The buildings in the block were of different heights, but by using the rope we reached the one on the corner nearest the river without a great deal of difficulty. This was a warehouse filled with baled cotton and closed up tightly with iron shutters to avoid the possibility of fire. At first it looked as if we were not going to get inside, but we finally found a window opening on a fire escape, with the shutters unbolted.

● The water in front of the warehouse was only about three feet deep and shallowed rapidly over the railroad tracks to the concrete ramp which led to the coffee dock a hundred yards away. Still, after our recent experiences we didn't feel like wading through it.

Jim thought of the plan which we carried out. We rolled bales of cotton from the warehouse and built a dry road—and it wasn't as easy as it sounds. A bale of cotton weighs five hundred pounds. The Colonel and the Professor were willing enough to help, but they weren't of much use for heavy manual work.

When the road was completed to the ramp Jim and I were pretty tired. We had put down the last bale when the tyrannosaurs attacked us. Jim saw them first.

"My gosh, look what's coming!" he yelled to me.

They were swimming down Gravier Street, thirty or forty of them, and looked like immense alligators with their heads elevated several feet above the surface. As we raced toward the warehouse where the Colonel and the Professor were waiting, unconscious of this new danger, the tyrannosaurs caught a glimpse of us. Fortunately they paused for a minute to watch us.

Then they raised themselves from the shallow water on their rear legs and tails and leaped forward like giant kangaroos. We hadn't far to go, but we reached the warehouse entrance pretty nearly in a dead heat with the animals. They were so close, as we slid the iron-sheathed doors shut, that one of them got his nose pinched and set up a most tremendous bellowing.

The only light on the ground floor of the building came through the door, and after it was closed we had to feel our way around. We located the other two men by their voices and managed to reach the second floor window through which we had entered the building. We decided to go back to the roof and try to signal the ship with our guns. We remembered that the tyrannosaurs must be able to climb, because the first one we had seen was crouching on a Common Street roof. Some of them might be waiting for us at the top of the fire escape.

As it turned out, we needn't have worried, for the roofs were clear. We gazed down into the street and saw some

of the great animals swimming around in the green water. Others were crouching in the shallows, perhaps watching for us to come out of the building. Half a dozen had climbed the ramp which leads to the docks. These last were now crouched close to the ground, watching intently something which we couldn't see.

"Maybe some of the boys are coming to hunt us," said the Colonel anxiously. "I wish we could let them know what they're up against."

A couple of minutes later we saw fifteen or twenty men advancing cautiously along the railroad tracks now barely covered with water. They had evidently seen the tyrannosaurs, which had so far made no effort to attack them.

Colonel Lounsbury fired his gun into the air quickly, three times in succession.

The advancing party paused and looked around. The Colonel fired again and this time they saw us.

The noise infuriated the tyrannosaurs. Those surrounding the warehouse began another desperate attempt to reach us. They even tried to climb the bare walls. A couple of them succeeded in getting as far as the awning over the loading platform.

The animals on the ramp leaped to the tracks. The rescue party apparently had no arms except their automatics. There was a moment of confusion and then the pistols began to bark.

We found out afterward that a tyrannosaur could be killed if a bullet entered its skull between the eyes or, if it was standing, a little below and to the right of the left foreleg. The bullets from an army forty-five automatic would penetrate the thick scales which covered the body, but except at these two points would not stop the creature in time to be of much service to the man attacked.

The six maddened tyrannosaurs plunged into the compact group and in less than ten seconds three of the men were dead, practically torn to pieces. A few seconds later two of the saurians dropped into the shallow water disabled. The rain of bullets at close range was producing its effect. A third rolled over and the survivors, screaming like wounded elephants, turned tail and fled.

● The bellowing of the wounded tyrannosaurs stirred up the rest of the herd. They began to roar and the men rushing around the corner in pursuit got a glimpse of them. One look was enough. They turned and dashed up the ramp toward an open door in the coffee dock. The tyrannosaurs leaped in pursuit, covering thirty feet in a jump. One of them got inside before the men slid the door shut. The others seemed maddened at the sight of their dead and dying companions. They tore down a shed and raced up and down the railroad tracks trying to find a way into the dock building.

We had watched this battle unable to help. Now the animals were between us and the dock, so there was nothing for us to do at the moment except stay where we were.

"We won't have to wait long," said Colonel Lounsbury. "They'll bring machine guns next time."

Half an hour later one of the sliding doors in the coffee dock was pushed back and we saw the shields of two machine guns in the opening.

The tyrannosaurs had quieted down by this time and at first they didn't pay any attention to the new enemies. Suddenly one of the machine guns began to chatter as its muzzle was directed toward a group of the beasts crouched under the wall of the Anheuser-Busch Building.

They leaped up bellowing as the stream of bullets stung them. At first they ran around in bewilderment, but then the noise attracted their attention to the guns. Two of them were disabled by this time, but the others started toward their attackers. The rest of the herd joined them and they looked more like pictures I have seen of charging buffaloes than anything else I can think of.

"The guns'll never stop them!" exclaimed Jim.

The Colonel, watching with grim face, said nothing.

Both machine guns were firing now and every steel-jacketed bullet must have found its mark in the dense group of animals. Some of those in front fell and impeded the progress of those behind. Meanwhile as they got closer to the guns the execution became more deadly.

They were within forty feet of the doorway as near as I could judge when the slaughter became too much for them. Those that were able turned and fled, leaving at least half their number dead or disabled on the ground.

We watched the survivors until they were out of sight. Then we hurried across the path of cotton bales to meet our rescuers who were busily engaged in despatching the wounded tyrannosaurs. The specimens now at the New York Museum of Natural History and at the Smithsonian were those killed in this battle.

Before night the news of what had happened to our landing party and the condition of things in New Orleans was speeding to all parts of the world. Colonel Lounsbury was in communication with Washington and later with the commanders of the other vessels of the rescue fleet lying in the Mississippi. It was quite certain that the members of our landing party who had disappeared were dead. As far as we were able to determine, there was no one left alive in New Orleans.

I assume that some plan was agreed on that night for further exploration of the devastated area, but if so, it was never carried out. Before morning the great question was whether we were going to save our own lives.

Jim and I were very tired and we went to bed as soon as we could get away from the newspaper men on board the General Pershing. I don't know how long I had been asleep when I was wakened by being thrown from my berth to the stateroom floor. I sat up, dazed, to see Jim staring at me from the lower birth.

"Hurt?" he asked.

"Guess not," I answered, feeling over myself gingerly. "But gosh, what threw me out?"

He shook his head. "I don't know. I was asleep and whatever it was woke me up. There it is again."

CHAPTER V
A New World!

● There was a sudden shock as if the boat had gone aground while it was moving pretty fast.

I grabbed my trousers and shoes and rushed out, with Jim following. The cabins were filled with excited men, none of whom seemed to know what was happening. I made for the upper deck. Suddenly there was another shock which sent me reeling against a wall.

"Earthquake!" yelled one of the stewards as he ran by.

I reached the upper deck just as the engines started and the vessel began to move away from the levee. It was a ghastly enough scene on which I gazed. The stirring up of the water had increased its phosphorescence; the green flames were leaping fifteen and twenty feet in

the air. While on the water we felt an earthquake shock only occasionally, on shore they must have been nearly continuous. There was a constant roar of falling masonry. The tall buildings swayed as if they were pasteboard in a high wind. The walls covering the steel frames began to crash. The American Bank Building went first, the masonry peeling off a floor at a time. As it was rapidly becoming a gaunt twisted skeleton, the tower of the Hibernia Building crashed.

We were several hundred feet from the levee when everyone was thrown to the deck by another shock. This must have been worse on shore, for the sound of falling buildings increased to an ear-splitting roar. As I pulled myself to my feet I saw the great coffee dock and the concrete levee to which we had been moored gently slide into the river.

An onrushing wave picked up the *General Pershing* and swept her toward the Algiers shore. If it had happened five minutes before, when she was broadside to the levee, it would have been the end of another good boat. As it happened, we were headed toward the channel and the wave hit our stern, poured over the upper deck, smashed a lot of windows and rolled on, leaving us behind.

In a few minutes the boat was again under control and slowly moving up the river. Ahead of us we could see the searchlights of the other vessels of the fleet, all fleeing from the danger zone. I glanced back toward the doomed city in time to see the steel frame of the American Bank Building sway farther and farther to one side. Then suddenly it wasn't there!

While I was watching I heard an exclamation of alarm from behind me. I whirled around in time to see a great column of flame leap into the air in the south. It was impossible to judge at night its distance from where we were, but we found out later that it was the first of the volcanoes which rose that night from the floor of the Gulf of Mexico. The column of flame extending five or six miles into the sky was not steady but had a regular pulsation. Each time it leaped upward a great crescent of golden light seemed to leave it and float away into the heavens.

The earthquake shocks were becoming more frequent, about two or three a minute, with a severe one every five or six minutes. The engines were under forced draught, but it was hard to tell how much progress we were making. The current seemed to be becoming more rapid. On both banks the levees were sliding into the river. There was a good chance of the channel becoming blocked or too shallow for our fairly deep draught vessels as the river spread over the surrounding country.

A second column of flame rose into the air not far from the first. This was followed by others until there were six of them extending across the southern horizon. Dark gray sand began to fall on the deck in a heavy shower. At the same time electrical phenomena occurred. There were continuous lightning flashes in the south; St. Elmo's fire appeared all over the vessels, every sharp point was surrounded by a glow.

I happened to wonder about the time and glanced at my watch. It was eight o'clock in the morning and still as dark as midnight. I found out afterward that the darkness that day extended over half of the United States. It was not until several hours later, fortunately for us, when we had progressed some distance up the river, that the great earthquake occurred which levelled most of the buildings south of the Ohio River and east of the Rock Mountains.

It came without warning after we thought the worst was over. I was knocked unconscious and have no idea how long I was out. At that I was more fortunate than most of the others aboard. Several were killed and a great many seriously injured.

When consciousness gradually came back to me I saw that the vessel was lying on her side with the decks sloping at an angle of forty-five degrees. I dragged myself to the rail and looked down on a sea of mud. The river had disappeared. A hundred yards away there was a great chasm through which I could hear water roaring.

There was still something wrong about the scene and I couldn't tell what it was. I rubbed my hand across my eyes, and then I knew. There was the hundred yards of mud in which thousands of fish were struggling between the vessel and the brink of the chasm—but the chasm had no other side. Beyond the stretch of mud was nothing! It was as if there you stepped off the end of the earth.

I'd had a nasty knock on the head and I guess what I saw didn't make me feel any better. Anyhow, I went out again.

When I next opened my eyes, Jim was bending over me.

"Gosh, I'm glad you're all right!" he exclaimed. "You had me scared for a while."

I sat up and the first thing I noticed was that the deck was level again. "Are we afloat?" I asked.

He nodded. "We sure are, and you won't believe you're awake when you see what's happened."

"I don't want to look," I said. "I saw it before."

"Come on," he insisted. "You never saw anything prettier."

I stared at him. "Prettier!" I repeated. Then I realized that the sun was shining from a bright blue sky. There was a tang of salt in the air. I could hear the throb of the engines.

Jim helped me to my feet and I looked around. I rubbed my hand over my eyes again. No mud, no river, no land, nothing as far as I could see except blue sea ruffled by the wind into waves topped with tiny whitecaps.

"Where are we?" I demanded, turning to Jim.

"Somewhere in the Mississippi valley below Natchez, or where Natchez was."

"What does it mean?" I asked blankly.

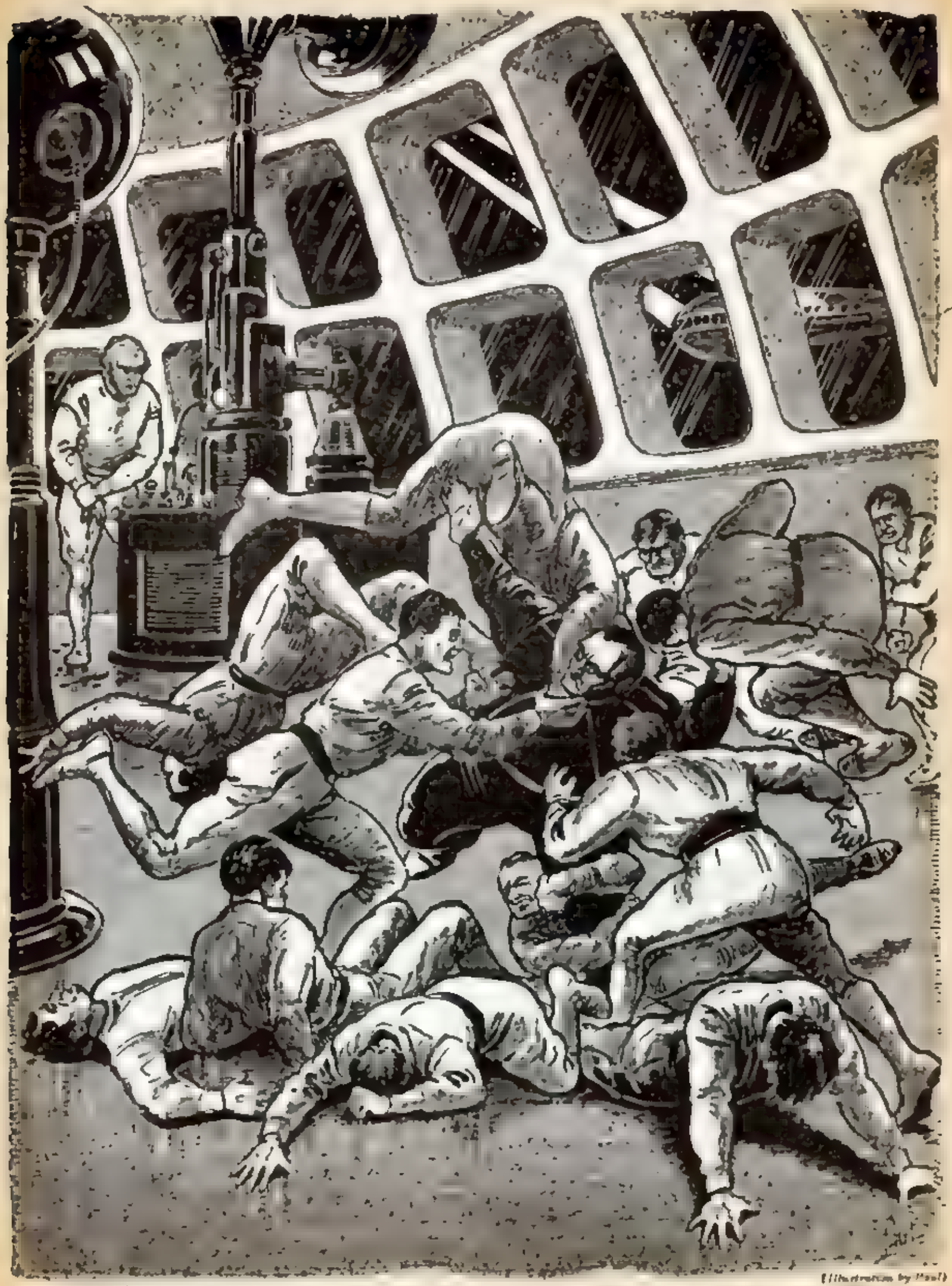
He shrugged his shoulders. "You can guess as well as anybody else. All we know is that the Gulf of Mexico now covers all the Mississippi valley. There was the earthquake, the land sank and the ocean rushed in."

"Well," I said, slowly looking around, "it looks as if we'd had grandstand seats for the biggest thing that ever happened."

This was intended to be a narrative of the personal experience of two who happened to see more of the Great Catastrophe than most of those who survived. Therefore I have made no attempt to take sides in the scientific controversies that have raged since. However, in regard to one subject our experiences give a certain weight to our views.

Most scientists believe that there was some quality of the green substance deposited in the water by the planetoid that almost miraculously stimulated growth. Our adventures with immense sea creatures apparently support this theory. On the other hand, certain scientists claim that the tidal wave washed up over the southern portion of the United States creatures that ordinarily live in the depths of the Gulf of Mexico and the Caribbean Sea. They have

(Concluded on Page 604)



(Illustration by Paul)

Men began to pile on Barclay. But he was like a rubber ball. He bounced about the room with unbelievable speed, merely slapping men into unconsciousness.

SPACE RAYS

By John W. Campbell, Jr.

● Eight large men were crowded in a small emergency space ship. They were physically crowded; the air was bad for the little ship was built for three men, and the capacity of the air apparatus was hardly sufficient for them. And so the E.E. 4 was wobbling under her controls, with acceleration greatly reduced.

Lt. Roger Lane and his men felt exceedingly foolish. They had just surrendered without protest to a pirate, for the altogether-too-good ship *Robin Good* had suddenly appeared alongside the Lane Patrol ship L.P.C. 563. The air in the patrol cruiser glowed faintly blue, and the crew of seven men and two officers slumped down where they were. The latest Farrel Atomics, capable of generating fifteen million horsepower for the defense of the cruiser hadn't even started. Nine helpless men watched while *Robin Good* sent over a ship load of men in space suits. Each carried a small hand projector, and without entering the beam from the ship they turned their small projectors on the men in the cruiser.

Fully conscious, but helplessly paralyzed, Lt. Lane and his men were dumped unceremoniously into this tiny escape ship, and turned adrift, without radio or weapons. Lane was heading with all speed for Mars, some thirty million miles away. But one of the pirate crew had thoughtfully removed one of the miniature Farrel Atomic engines, with the result that their McKinley space-drive plates were not getting the power they should have—the lights were dim, and the already overloaded air apparatus was functioning badly.

Pilot Warren was in the tiny cubby-hole in the nose of the ship, speeding with all the acceleration he could muster for Mars, although the officers of the ship were not so enthusiastic about getting there. It would have been bad enough to have been unable to find the pirate after being sent out for the purpose of overhauling his slower ex-space-yacht, but to have lost the speedy, powerfully armed space cruiser without a struggle! Commander Morrison would make some exceedingly pointed remarks, and it would be a long, long time before Lane got a new rating.

"I'll bet Barclay gets a work-out outa this," said Patrolman Reynolds, sourly.

Yes, decided Lane, Special Captain Donald Barclay would probably get some work. He hoped that Barclay would be picked up by the pirate too. Barclay had an annoying habit of doing what he was sent to do. Nobody ever said anything about it, least of all Barclay, but those reports on the bulletin board had become monotonous.

Lt. Lane permitted himself to grouse heartily, silently and hungrily for thirty hours while the escape ship limped into port. He decided to permit himself a meal, and a shower before appearing before Commander Morrison. It would be a teleview appearance, because Morrison was on Earth, but the Commander had long since learned the knack of being nasty over the televisor. He would be specially nasty this time. Lane took a long pull on some forbidden *tekey*—fermented Martian cactus juice—and felt ready to face the Commander.

Half an hour later he came out of the booth. It was after sunset, the air was chill, but Lane was sweating profusely. Morrison had just grinned and nodded. Lane wished he could grin like that. Then

Reasonableness In Science Fiction

BY HUGO GERNSBACK

● When science fiction first came into being, it was taken most seriously by all authors. In practically all instances, authors laid the basis of their stories upon a solid scientific foundation. If an author made a statement as to certain future instrumentalities, he usually found it advisable to adhere closely to the possibilities of science as it was then known.

Many modern science fiction authors have no such scruples. They do not hesitate to throw scientific plausibility overboard, and embark upon a policy of what I might call scientific magic, in other words, science that is neither plausible, nor possible. Indeed, it overlaps the fairy tale, and often goes the fairy tale one better.

This is a deplorable state of affairs, and one that I certainly believe should be avoided by all science fiction authors, if science fiction is to survive.

In the present offering, Mr. John W. Campbell, Jr., has no doubt realized this state of affairs and has proceeded in an earnest way to burlesque some of our rash authors to whom plausibility and possible science mean nothing. He pulls, magician-like, all sorts of impossible rays from his silk hat, much as a magician extracts rabbits. There is no situation that cannot easily be overcome by some sort of a preposterous scientific—(as he terms it)—gimmick. Hurling fifteen million horsepower from one space flyer to another means nothing. If he has left out any colored rays, or any magical rays that could not immediately perform certain miraculous wonders, we are not aware of this shortcoming in his story.

In other words, the author proceeds to burlesque science fiction—not only science fiction, but he burlesques his own abilities, to show us what really can be accomplished when the bounds of reasonableness are overstepped.

Yet, all in all, he has spun a delightful tale which will, nevertheless, entertain you, and keep your interest throughout. We were tempted to rename the story "Ray! Ray!" but thought better of it.

I have gone to this length to preach a sermon in the hope that misguided authors will see the light, and hereafter stick to science as it is known, or as it may reasonably develop in the future.

he wouldn't have to bawl out sloppy workers. Lane went to the barracks and was soon asleep.

Meanwhile Commander Morrison started things moving. As he cut off the teleview image of the harassed young officer on Mars, he pushed a button, and his orderly appeared.

"Special Captain Barclay, at once please." The orderly saluted smartly and right-about faced. Ten minutes later a peculiar looking man entered the room behind the orderly. Morrison greeted him with a friendly, easy salute.

Special Captain Don Barclay smiled at him. Barclay looked to be about five feet tall by four feet wide. Actually he was nearly five-feet seven, but his enormous breadth belied it. Barclay was a type of man seen rather rarely on the minor planets. He was a Jovian.

Three generations back his people had migrated from Earth, when Jupiter's colonies were newly opened, in 2250. Men and women picked by the Interplanetary Council, for both physical strength and health, for courage and for trustworthiness. To them had been given the task of developing a new race, a race of giants. Under a gravitational force of from two and one half to three times that of the Earth, they had to learn to live again. The cowards never started, the weaklings died. Never was it more true than of this Jovian colonization.

● Born and raised on this planet, where all things must move rapidly to keep up with their surroundings, where a falling body moved two and a half times as quickly as on earth, Don Barclay had become a giant. His legs were thick, heavy and almost blocky, his arms were built on the same plan, his tremendous shoulders seemed rounded and padded as though he wore wadding under the tight elastic Patrol uniform. His massive head, crowned with crisp black hair, seemed set directly on his shoulders, the neck seemed missing. Five feet seven—and he weighed over two hundred and ninety pounds!

"More work, Commander? I thought I was to have a week off after that little run in with the Eugenic people." He smiled, his lean, almost black face, burned from ceaseless exposure to the unshielded ultraviolet rays of the sun, creasing in a good-natured smile.

"Uhuh—so did I. But remember, this isn't a business, it's a war, only we don't know whom we're fighting half the time. This time it's Percy DeWare Jennings, better known as 'Robin Good'," replied the officer sourly. "He just stole one of our ships—the L.P.C. 563, Lt. Lane in command."

"Ouch—he tickled us that time. That does demand some action. What else has he been doing. I don't know all his story."

"Started off with a ten-man ship he bought second-hand on Mars, only half a million horse, but he and his gang captured an ex-yacht converted to an excursion ship. They used that about a month, then they captured this ship of ours. Fifteen million horse in perfectly good Farrel atomics, with induction rays, magnetic and induction screens, super-sensitive electron balance detectors. It hasn't got protolectric guns, but has got the shields. In other words he's got everything we've got, plus his own paralyzing ray. All in all a sweet situ—"

Commander Morrison stopped. His orderly had intruded hurriedly with "Pardon me, Commander, but this broadcast—" He snapped on the news broadcast machine, and the screen glowed with the image of a popular humorous news man.

"—anonymous person has sent in this tip from space. They gave data, and checking shows it's right. Believe it or not, 'Robin Good' has sneaked one over on the Patrol for sure this time. He stole their patrol Cruiser 563, got away with it, and sent the men home, neatly wrapped up in an escape ship designed for three men. They landed on Mars, I hear. All this happened yesterday, Sol 3, of the year of our Lord 2374. I certainly would like to have seen our good Commander Morrison's face when Lt. Lane, commanding 563 reported *that* in. Hah! .Hah!"

"Damn! Now who in the name of the nine planets sent that dope to that blabber-mouthed nit-wit!" roared Morrison. "I'd like to twist his squawking neck for—"

"And," continued the news machine imperturbably, "I'd like to see Commander Morrison's face right now if he's listening."

Had he been able to, he would have seen it tinged with an apoplectic purple, the stiff, iron-grey hair bristling erect on his head, his mouth open and gasping for words to describe his opinion of the man.

● The orderly shut off the machine and hurried from the room before Commander Morrison could regain his tongue.

When the color had receded, his mouth closed with a snap. He turned on Barclay with a roar. "Captain, GET THAT MAN, AND BRING HIM IN ALIVE!"

"I'll try," said Barclay, saluting. He left the office. "Whew—I think I'd better. And it'll be one sweet job. Nobody ever sees that man's ship; he's supposed to have found the secret of invisibility, and I'm supposed to find him.

"I think some research is in order." His stride suddenly became purposeful as he started for the elevator. He dropped swiftly to the street, went down the hill to the edge of the Patrol Headquarters grounds, and entered the city of Morristown itself. At the gates he paused long enough to slip on a suit of civilian clothes. Then he went directly to the monorail station, and swung aboard a car bound for New York City 33rd. The streamlined car darted forward as a McKinley drive plate in the nose come to life, and hurled itself along the rail fifty feet above the countryside toward the city.

At 33rd Station he descended, and stepped aboard the uptown walk, quickly moving over to the medium speed lane. At thirty-five miles an hour he was swept along through the magnificent canyon of New York. The flashing vitreous walls of huge buildings, made of colored glass bricks, windowless, save on the first two stories where show windows broke the sweeping lines of the pinnacles and lighted the street with reflected lights of red and gold and blue. Within, perfectly controlled artificial lights and perfectly comfortable artificial weather displaced the glaring sunlight and humid heat of the streets.

To the man of Jupiter these cities were forever wonderful. Jupiter, burdened with its heavy gravity, could not build so high, because the sheer weight would have pulled the structure down. On Mars was the Martian Lines Tower, carrying the flag of the Martian Lines interplanetary ships one full mile into the clear, crisp air—standing tall, almost alone among the massed ranks of giant structures that made this a city like none other.

Finally, at 87th Street he left the moving walk, and went

down to the towering skyscraper library of the City of New York. It was the scientific news journals that he inspected first. Journals of six and eight months back, before Dr. Percy DeWare Jennings had gone a-pirating, when he was a highly respected bio-physicist.

But there was little to indicate that he might have discovered the secret of invisibility, his work had not been along those lines. But six months ago he had announced his discovery of the long-sought paralyzing ray that was not fatal. Others had made paralyzing rays that paralyzed—permanently, however. The trouble was that they paralyzed the heart and the lungs as well as the arms and legs. But Jennings had announced his discovery of a non-fatal paralyzing ray. Scientists of the world had scoffed—it was an impossibility. "Come and see!" demanded Jennings.

They came. But they did not see, for something went wrong with the apparatus. First it killed a dog, then a mouse ran about under it unhampered. The scientists went home laughing.

Perhaps Jennings had gone slightly mad. At any rate he disappeared for five months, to turn up with a pirate gang. They looted passenger liners, helpless under the paralyzing ray, but they themselves could not enter the ray without being paralyzed, for they had no screen for it.

Don Barclay mused, investigated, and got later data—accounts of the experiment written by scientists who had seen it, both immediately after the demonstration, and five months later when Jennings proved his claims all too thoroughly.

It was a long patient search, and took two days. The third day Special Captain Barclay of the Interplanetary Lane Patrol became Dr. Donald Barclay, and went to the Patrol research laboratories. He spent three more days there. Commander Morrison asked him why he hadn't started, and Barclay merely replied he had gone.

But on the sixth day he reported to Commander Morrison, and asked to be assigned to a ship.

"Naturally," snapped Morrison. "But why didn't you come after it sooner?"

"I was working on leads here," replied Barclay. "And may I have X-531?"

"What!" gasped Morrison, "X-531? That's a one-man experimental ship."

"With ten million horse in the brand-new Ridgely Automatic Atomics," replied Barclay. "And I want another ship anyway, the new Twenty-five-Hundred. And I'd like Dave Wier to take it, with a crew of Jovians. I'll try to find the pirate myself in the small ship. I can hide a mosquito like that in space, with a little black paint on it, and some red windows, with green lights in the ship. I'm betting that's what this Jennings does with his *Robin Good* anyway. I hear that Grantland has just finished a new type fast-action infra-heat photocell that will work a viso-screen. I want one of those installed, that'll make anything visible in space. And—here's something to install in the I.P.C. 2500."

CHAPTER II

Barclay Goes to Work

● Morrison looked at his crack Special Captain sourly.

"Oh, yes sir, and can I give you the rest of the fleet?"

"Will you if I bring in Jennings and his crew—unharmed?" smiled Barclay, looking at the news-receiver, clucking and chuckling to itself on low power.

Morrison got slightly red and snapped "Yes!"

"And look at this, sir!" suggested Barclay. Morrison took the sheaf of papers, and glanced hurriedly at the first lines, stiffened, and scanned the paper rapidly. "Good Lord, will it work?"

"It does, Commander, I tried it. I did some research on reports I found in the Public Library, and made some experiments."

"But—don't you want it in the X-531?" he asked in surprise.

"No sir, I don't. I want the Miller Twins instead. I have an idea that works better this way."

"But the pirate may capture you, and learn the secret of the Miller Twins. That's our latest and best weapon. Why, the Twenty-five-Hundred isn't even commissioned yet, and she's the only one that's got them, and the insulation," objected the Commander. "I can't let Wier take that ship, she isn't commissioned."

"Commander, I'll bring in Jennings if you'll let Wier take that—if he has to steal it unofficially. Why can't Wier take it out on trial maneuvers?"

"Ahh—well," said Morrison, scowling at the news machine, "go ahead—but if that half-witted flap-eared donkey reports that Jennings is using the Miller Twins before any commissioned ship—you needn't report back!"

Barclay's lips cracked in a slight smile. "He may—but don't worry Commander—it'll be my own hide that suffers."

Barclay left with the requisition slips Morrison had been filling out. And twenty-four hours later, after fifteen hours of concentrated sleep, Barclay left Earth in a tiny pea-pod of a ship, scarcely twenty feet long. But it carried ten million horsepower generators humming with a soft, pleasant melody behind him. They occupied almost the entire bulk of the ship, the pilot was forced to sleep in his pneumatic springed pilot chair.

A million miles from Earth, on his way toward Mars, Barclay took a small key and unlocked the acceleration stop-block. Presently he moved the metal stop-block from its position at "4000" to "7500". Four thousand centimeters per second per second was all any earth native could stand in the way of acceleration and still retain sufficient consciousness for fighting. Hence the lock, lest some foolhardy fighter try more. But Barclay, brought up on a world where the natural acceleration and gravity was nearer 3000, could readily stand the higher value.

And somewhere in space he knew that Dave Wier, his support in the Twenty-five Hundred, was manipulating a similar key in a similar lock-block. His crew of twenty-two men were all Jovians, for that acceleration might well be fatal to the earth-native.

Presently Barclay locked the block again, closed down the control panel hood, and forced the accelerator control over. He pushed steadily till his face grew pale under the nearly black complexion years in space had given him. His arm was knotted with great muscles, the shoulders bulging and straining at the fabric of his uniform. A black metal needle had long since passed the red danger line on the accelerometer gauge, and hung at 7500. Barclay gradually eased back, and the needle dropped to a comfortable 2750. Barclay got up, and stretched under Jupiter-normal.

He prepared a hasty meal while the ship darted along under automatic controls, jogging slightly now and then as a meteor came into the range of the exceedingly sensi-

tive electro-static mass-detectors. Presently he finished, cleaned away the scraps by dumping them into space, reseated himself and shoved the acceleration up a bit. Hour after hour he bored on into space, his ship a black dot in a black void.

● Three days later found the tiny ship far beyond Mars, circling near the asteroids. *Robin Good* was reported to work out this way in search of Jupiter traffic. Barclay had been following the shifting Jupiter-Earth lane for two days now. The Space Liner *Mira* was due to pass in another day, from Jupiter to Earth, and loaded with the usual assortment of heavy metals, platinum, iridium, osmium, some uranium, and a full pound and a half of jovium, element 97, on which the pirate must depend for renewing his atomic engines.

The space patrol cruiser had had only a sixteen-hundredth of a gram left in the supply bins, and an eight-thousandth of a gram in the engines. This might well last a year in ordinary service, but under the heavy drains the pirate's constant warfare would make, it would probably give out in six months. With a pound and a half at his command, he could retain a full ounce, a lifetime supply, and sell the rest of the activator. Barclay felt sure he would attack.

Barclay was right. He was sleeping when the exceedingly delicate electro-static apparatus gave him the first warning of the *Robin Good's* approach. The tiny X-531 spun on her axes in an instant—and space was empty. Nowhere could Barclay get a sight of the ship the instruments said was less than a mile away, and approaching! Then—the infra-red screen, and the long, black hull was suddenly visible exactly where the instruments had said it would be. Invisible in ordinary light, the radiated heat made it shine a pale green on the screen.

Chuckling, Barclay shoved home a small control lever. The white cabin lights suddenly snapped out, and green lights came on in their stead. Simultaneously, the ship leapt forward at her full 7500 acceleration, at right angles to the line between the two ships. Outside, the pirate looked in vain for the tiny ship that had been shining red before him. The green light did not penetrate the red glass windows. Barclay was lost, and the special electro-static field he was setting up, fluctuating wildly, made it impossible to locate him with the instruments.

Ten miles from his original position, he swung, till the nose of his ship pointed toward the pirate craft, and a pair of hair lines crossing on the center of the infra-screen covered the center of the pirate ship. The X-531 suddenly chattered violently as a machine gun, shooting one inch slugs loaded with atomic explosive iron dust, raked the pirate craft from stem to stern.

The ex-cruiser's magnetic screen stopped them, but they resulted in a magnificent display of fire-works that would have blown an entire nation off the face of the earth. Barclay moved. From another angle he centered his cross-hairs on the screen and pushed a button. Suddenly a spot five feet across on the wall of the pirate ship was blazing red—orange—and then black, while a sea of splashing, warring energy appeared on the induction screen.

The arcing decreased abruptly as Barclay cut down the power on this, and turned five million horsepower into an infra-heat ray. The result was an instant blaze of white light, and a puff of white-hot vapor from the bow of the *Robin Good*. The black outer-hull soaked up the heat like a blotter taking water—and destroyed itself. But suddenly, in the wink of an eye, the black was gone, and the clean, shining metal of the patrol cruiser appeared. Instantly the reflected heat struck the little X-531 and Barclay was compelled to shut off his beam and shift hurriedly.

A sizzling induction beam from the pirate snapped by where he had been a moment before. Barclay felt it was time for the Twins.

Twin, milky-white columns of light reached out like pipes of milky glass. They swung abruptly, and touched the pirate ship some twenty-feet from the tail. Instantly the metal between the two beams blazed into white heat, and exploded out into space. And immediately after, a second puff from the same spot indicated the destruction of the inner skin of the ship. A long fountain of light stood out from the wall of the ship as the air rushed out.

Barclay moved his beams slowly and steadily, while the generators behind him whined and howled steadily. Ten million horsepower were pouring into those beams, and into the metal of the other ship. For less than five seconds that work continud. The *Robin Good* rolled, twisted and struggled, but the little mosquito ship hung grimly in place, and poured its deadly beams in. Then a pale blue-green ray, scarcely visible in space, reached back along the twin milky beams, and touched the mosquito ship. Suddenly the X-531 followed a perfectly straight course, and the twin beams wandered far afield.

Inside the ship the air became luminous with the blue-green beam, and Barclay slumped inertly forward over his instrument panel. His eyes were open, but stared motionlessly straight ahead. Don Barclay was fully conscious, but absolutely unable to move a muscle.

● The blue-green luminosity crept forward in the ship, till only the pilot and the pilot's seat was bathed in it. Presently something grated on the emergency escape air-lock, and there was a hiss of gas, then a steady pumping. A moment later a giant of a man stepped from the inner lock-door, a flashlight in one hand, a ray-pistol of some sort in the other. It was a curious mechanism, a pistol grip, a flexible lead looping back along his arm to a small pack on his back. The business end of the pistol ended in a lens of wires, woven and crossed with infinite care, the whole protected by bars of metalite, an insulating, non-conductor of heat with the strength and polish of many metals.

The man was a giant, but such a giant as one might see in dreams—nearly six-feet-eight in height, broad in proportion. He wore only light green rayon shorts, a short-sleeved shirt to match, and a broad leather belt from which hung three holsters, and two more pistols.

But his face was an awful travesty of what Nature had meant. At some time he had been in a ray-fight, the entire left side of his face was a mottled purple and angry red, the right side was puckered and twisted till it drew the flesh away from the teeth, a horrible artificial grin resulting. The tip of the nose was entirely missing. But from just below the eyes to the hairline the flesh was smooth, and deeply tanned, almost black from exposure to the sun of space. The face was topped by a shaggy, unkempt mop of glaring red hair.

The motionless Barclay groaned inwardly. Belasco Red! Six months before Lt. James McRuddy had reported the death of this devil in human form. When the

Belasco gang had been cleaned out of Thenton, Mars, he had been rayed, across the face, the flesh charred black. A companion had been there to drag him away. The companion had been captured two days later and told the Patrol that Belasco Red had died and been cast into space, while the ship struggled to make good its escape.

Belasco Red was grinning more broadly now. The pistol suddenly shot out a blue-green ray which centered on Barclay's neck. A great hand waved, and the beam from the pirate ship snapped out. Belasco walked forward gingerly, keeping the ray on Barclay, then picked him up and carried him back to the lock, through the metal communication tube and into the pirate ship.

"Looka wat we caught," he laughed, dumping Barclay on the floor. For a fraction of a second the patrolman was out of the ray, and the instant his body touched the floor he leaped up like an un-leashed spring. His hand darted toward the giant outlaw's pistol, but halfway it fell to his side as the ray touched his neck once more.

"It wants to fight I think," said Belasco. "It's a patrolman from the looks of the suit. Shall we play with it awhile?" His grotesque face face writhed into an expression impossible to describe.

A man of medium height, with smooth sandy hair had looked into the room, where three other pirates had been when Belasco returned.

"Oh, I say, that looks like Special-Captain Barclay. Truly we're honored, you know, Captain, but we must detain you a while.

"And, Red, let's let him help us a bit. I'm sure the fellow will be glad to. That was a nasty little jolt he gave us with those skim-milk rays of his. Did you look at the apparatus, Thed?" He spoke to a stockily-built man to one side. Thed was nursing a burned hand.

"Yeah—it's been gimmicked. H-T stuff. Almost took my hand off. I was careful enough, but the damn thing turned loose half a million volts soon as I moved the control panel. I'll be damfino how it could. I shut off the generators. They were new, too, but they blew out when the beam-control went off."

"Ah—the new Ridgely Automatic Atomics. They can start themselves, Thed. And they're much more powerful. Too bad. We'll have to capture the Twenty-five Hundred when they commission that. I hear it will be equipped with the new generators.

"Well, it's all right. Cast the machine loose, burn it, and I'm sure Special-Captain Barclay can help us. I know a bit about rays and such myself. We should be able to figure it out together, don't you think so Captain?" The lean man looked at Barclay. "Yes, I think so.

"By the way, Red, just go on and move into position for the *Mira*. We won't need to make repairs before then, and haven't time. We don't know just when she'll come, it may be a day or two, and it may be at once. We can make repairs there."

The disfigured giant gave the ray pistol to the stocky Thed, and departed on his errand. Presently the ship swung somewhat in its course.

"Thed," said the sandy-haired one, "suppose I try using that pistol. I'd like to talk to our friend here, and he seems sulky." Silently the blocky Thed passed the weapon over. Quickly the new possessor made several adjustments, then moved the beam from the neck to a point just below the middle of the chest. Don found his neck and head as well as his eyes could move now.

"Hello, Jennings. That feels better."

"Ah—quite so, quite so. Have you heard of the stimulator, I wonder?"

"No, I admit ignorance of that. A new invention?"

"Yes—quite. We ought to try it out, don't you think so, Thed? Please bring me the portable set." Thed disappeared silently. Barclay looked at the green-clad man before him. Save for the bright red-leather belt at his waist, his uniform was exactly like the others.

"Is it Lincoln green?" asked Barclay. "I never did know colors."

"No," replied Jennings with mock sadness, "it isn't. We couldn't get it. It isn't made, and I haven't had time to make any. Managing this little adventure is really trying. Belasco is so insistent that we remove all of your confrères on sight, he becomes hard to control at times. Ah, the Americans are so enterprising. He wants to destroy the entire patrol. I'm more modest in my desires. We English are apt to be. I'm planning to induce certain so-called scientists to witness a demonstration. That will probably take some time, and I do hope I will continue to have Belasco's co-operation. He's almost impossible.

"You see I treated his face, and not being a skilled plastic surgeon, it isn't beautiful. But he lived. It's healed now. I used a certain drug during the process, very quick healing, but unfortunately it's habit forming. He has hemorrhages of a most frightful sort if he doesn't get his daily ration. And I'm the only one who can make it.

"He tried once to make me give him the secret. Just once. But he's still hard to handle sometimes. You for instance. He will insist on being unpleasant about it. And I am hoping to take certain captives from the *Mira* this time, with our larger ship, equipped as it is with a brig for prisoners, it should be a lucrative trade. But he will probably be unpleasant.

"Ah, Thed. Thanks. This is the stimulator, Captain. Stimulates certain nerves. See?"

CHAPTER III

Man and Woman

● A pale orange ray reached out of the cone-shaped projector, and touched Barclay's foot. Involuntarily a cry rang from him. It felt like nothing describable, it seemed a red-hot vise was clamping on it, crushing every bone and tendon, while a dozen rats with white-hot teeth gnawed at it. It lasted but an instant, then the orange ray snapped out.

"The stimulator," said the bland Jennings, "affects only the nerves leading to the brain, stimulating them instead of paralyzing the nerves leading from the brain as does the paralyzing ray. It affects all the nerves, so the sensations are mixed, a feeling of fire, of crushing pressure, of breaking bones, itching, everything is stimulated.

"Very interesting," Jennings nodded to himself. "Very effective," he smiled.

A muffled vibration from the beryllium metal flooring announced the approach of some massive man, and presently Belasco's ghastly mask of a face appeared.

"Ah, entertaining him? Does he know what that apparatus is all about?"

"Certainly. He probably aided in its construction. They wouldn't send a man who knew nothing about it to test it would they?" snapped Jennings. "You do, do you not, Captain?"

"No," lied Barclay immediately. "It was secret stuff; they told me how to work it, rigged it with that gimmick, and sent me out. I couldn't even turn the gimmick off."

"There. You see he knows. Any man who didn't wouldn't be so explicit in what he didn't know, but would tell all he did," said Jennings, turning back to Belasco. "In the meantime, let's get that apparatus installed. You will show us how, Captain?"

"No, I can't, anyway," snapped the Patrol Captain.

Belasco's ham-like hand took the cone of the stimulator projector and a broad grin appeared on his face. "No?" The ray touched Barclay's foot. For a moment he stood it grimly, but as the ray deepened in color, as more power came on, he groaned aloud, sweat started from his forehead—and yet the ray was not actually harming him! Belasco grinned wider, and increased the power. This was not pain that was caused in a natural manner, it was pain that was actually a harmless nerve stimulation! There was no destroying fire to deaden the nerves, and lessen the agony, no grinding vise crushed them. They were merely stimulated.

In thirty seconds Barclay was willing to tell them what he knew. Belasco kept it up for a full minute. "More," he promised, "if we don't like your behavior. Will you need anything we won't have on the ship?"

● The pain left the instant the ray snapped off, and Barclay sat up dazedly, leaning back against his hands. His legs were powerless, a pencil beam shone on them, paralyzing him from the waist down. "Yes," he said faintly, "if you've got the regular stock-supplies."

"And more, Captain," Jennings assured him, "we always sail well equipped, as I like to do experimental work."

"All right. You, and your ray-engineer," said Barclay, "will have to help. And you'll need some extra heavy conductor cables. To be effective you've got to turn every horsepower of your generator into the Twins. Twin beams. And don't put fuses in the lines—" He talked rapidly, explaining the apparatus, how it projected a beam that would carry a current of electricity across empty space, explained that if the beams carrying their millions of horsepower encountered a rib in the ship, a surge might develop that would blow out a fuse, without reason but with disastrous results in battle, for several minutes would be needed to make replacements.

Belasco hung in the background as they worked at plans and drawings and calculations, his paralyzer and stimulator projectors ever ready. A fixed projector had been arranged that kept Barclay helplessly pinned in his seat, his legs powerless.

The ship rang with the clangor of repair workers at work on the damage done by the X-531.

In some four hours Barclay had finished the plans. Then he was promptly removed, and put in the brig, stout chains fastening him to the metal wall. The room, about thirty feet long by fifteen wide, was ordinarily used by the Patrol as an auxiliary storeroom, but the stores had been removed in preparation for the expected prisoners of the *Mira*. One tiny porthole opened on space, to give a view of star-studded heavens.

A row of bright lights down the roof offered illumination. The door was a single slab of solid steel three inches thick, sliding vertically against the ship's normal acceleration, and held in place, when locked, by the series of tremendous magnets all about it. Once settled in place, nothing short of a disintegration ray could move it. To move the door in any way, to fuse it, would generate a terrific current in it, and automatically give the alarm, as well as stun anyone standing on the metal plates of the brig.

Fifteen feet from the floor was the roof, and five feet below the roof was a little platform on which a guard could sit to watch a number of prisoners.

Belasco kicked Barclay in, and left with a growl. He would have preferred to kill the Special-Captain then, but Jennings pointed out that the projectors might not work after all.

He was securely chained, and the men left, locking the door magnetically. Barclay disposed himself on the hard bunk, stoically, smiled resignedly, with a flash of humor in his eyes. He went peacefully to sleep.

He woke, hours later, to the clang of the great metal door as it was shot upward in its slides. A small wiry man, clad in the green uniform of the pirate ship, entered and stepped to one side of the door, a sly grin of pleasure on his face. There was a portable stimulator set in his hand, which he set on the floor, retaining the projector cone and control mechanism in his left hand, and a paralyzer in his right. A moment later there was a heavy trampling on the metal floor, groans and low voices, a sharp command to "step along" in Belasco's harsh voice, and a string of men entered the room, clad in civilian clothes. There were tall ones and short ones and thin and fat, but they were all marched in and fastened by chains to the bunks.

Then finally two women came. The men had been reacting to their capture in all ways, from the height of indignation to the depths of groveling fear. The two women marched proudly in, looked over the room with a swift glance, and marched over to the least-crowded corner, about twenty feet from Barclay.

One was young, about twenty-two, the other, evidently her mother, about forty-five. Both were tall, broad and heavily built. The daughter was Junoesque, if not more. Her mass must have been easily 170 pounds, and her mother was equally heavy.

And, bringing up the procession, came Belasco. He entered the doorway, and stood waiting till everyone had been chained, his hideous face distorted in what was supposed to be a smile of satisfaction.

Silently, a second figure appeared behind him—Jennings. Quick dark eyes scanned the prisoners, and with a sudden narrowing stopped on a tall, powerfully built civilian, his face a deep brown from long exposure to Martian sunlight. But he was a terrestrial, his smooth-fitting elastic shirt proclaimed his muscles were well developed, not as a terrestrial becomes after months on Mars.

Jennings passed Belasco, and stepped nearer to the man. "Who," he demanded, "are you?" still scrutinizing him closely.

"Jimmy Durante, terrestrial engineer, working on Mars. Just made a trip to Jupiter for some special machinery when your murdering gang of cut-throats killed off the crew of the ship, and took us. I hope you get blood-poisoning."

● Jenning's face had relaxed from its intense stare of concentration. "No," he smiled, "you aren't Jimmy Durante, you're John Norcross, and you're Special-Lieu-

tenant John Norcross at that. You take the air. We don't want you." He pulled out the red-butted pistol that hung on his right side, aimed it deliberately at the center of the Patrol Investigator's forehead and pushed the trigger button. A blinding flash of white light sprang from it, a momentary odor of burned flesh, and the light disappeared as Norcross dropped.

"Take that," said Jennings to another uniformed pirate, "and throw it down the waste-chute." Jennings turned, and started back toward Belasco. "I'm going up to the pilot-house. The Twins have been finished, and while you were tying up our friends here, I tried it out on the old *Mira*. Cut it in two nicely."

"Shall I finish off this thing now?" asked Belasco eagerly, looking toward Barclay.

"Hmmm—no, I wouldn't yet I . . . ."

"I wouldn't either, Jennings," said Barclay, "I saw a piece of apparatus back at H.Q. that might interest you. Shield for the paralyzer ray, they claimed."

"That," said Jennings judicially, "is a lie. There isn't any. I can't make one myself, and I made the apparatus, and have the only ray apparatus."

"Of course you are also the best physicist in the system?" queried Barclay mildly, but slightly ironically.

"Not the best," admitted Jennings, "but the only one who knows anything about this apparatus, so you are a liar naturally. But we will want you in about twelve hours to look over the ray apparatus, so you needn't spring that joke about a paralyzer screen." Jennings turned and left. Belasco looked disappointed a moment, then his eyes lighted as he looked at the girl again.

Everyone had been looking at Barclay. Suddenly the elder woman gave a little cry of surprise. "Why! It's Donnie Barclay. I didn't see you at first. How did you get here?" Her voice was deep and powerful.

"Accidentally," replied Barclay with a wry smile, "and unintentionally. They captured my little one-man ship, Mrs. Willman. I'm sorry to meet you again."

Mrs. Willman smiled. "Apparently these pirates want ransom for us. I think Dick will get it. You've recognized Pat haven't you. It's been nearly seven years since you've seen her though." Mrs. Willman didn't seem greatly perturbed.

"I did," nodded Barclay," as soon as you came in."

"Shut up, you!" growled Belasco, looking at Don. There was a gleam of anticipation in his eyes as he looked at Pat Willman. "And you, little lady, are kinda heavy. But since a damn———of a Planetary Patrolman rayed me, I haven't seen a woman. I think it's about time. Take off the things you got on. I wanna see if I like you."

Pat Willman looked at him with unconcealed loathing. "No wonder," she said simply. "And naturally not. And I advise you not to try it."

Belasco grinned down at her from his six-feet-eight, some thirteen inches taller. "I think I will. I'd like it."

Mrs. Willman winked at Barclay, Barclay smiled grimly, and began to weave his fingers into the chains that held him.

Belasco advanced. A grim glint came into the girl's eyes. Belasco's huge paw reached out and grasped her light jacket. With a vicious jerk he pulled it away, tearing the material. Pat Willman stood clad in a light dress. "That," she said with cold anger, "is more than enough."

Belasco grinned, and reached out again. Pat Willman's hand moved like a streak of light, the great wrist was caught in slim white fingers that bit into the flesh, a terrific jerk pulled the giant toward her, and the other hand came up. Belasco was turned around, thrown down, and kicked, thoroughly pounded, then thrown away, gasping and roaring with rage and pain. He was thrown at least fifteen feet across the room, though the ship was moving under an acceleration of an earth-gravity now. He fell heavily.

He rose with a roar, and rushed back at her. Pat Willman watched him coolly. Pat Willman, twenty-two earth-years old, had lived practically all her life on Jupiter, a neighbor of Don Barclay. She could move about three times as rapidly as a terrestrial, and had the strength of three terrestrials her own size. She was easily more than a match for any terrestrial man, and she knew it.

CHAPTER IV

Rays and Rays

● Barclay had been looking about the room. The guard who had been at the door when the prisoners entered had gone up to his platform, and was interestedly watching Belasco's discomfiture at the hands of the Jovian girl. Belasco had reached her again, and this time she was slapping him. Her slap was comparable to the playful slap of a tiger, and Belasco was getting a more severe beating than many men could have given him. She slapped him with her left hand, which threw him against her right, her right hand slapped his ribs, and hurled him back to the left.

"Keep it up," her mother said softly. "Donnie is doing something."

Pat kept it up, till Belasco's head lolled with each jerk, and blood began to pour from his nose. The guard on the platform didn't interfere, he didn't like Belasco any more than most of the others of the crew. In fact he was laughing. Finally Pat threw the unconscious giant into the middle of the room. The guard looked at him, but made no move to aid him. Pat Willman also looked at him, her breath coming rapidly, for the air in the ship was thin for such exertion, used as she was to Jupiter's dense atmosphere.

Barclay crouched slowly as she turned to look at him, then, like a flash of light, he bounded straight into the air, and toward the guard platform thirty feet away, and ten up. His first enormous bound carried him directly beneath the shelf-like platform, and as the guard rose with a sudden cry of amazement, to look over the edge, a powerful hand grasped him, and hauled him downward. As he fell, Barclay eased the landing with a catlike softness, his great hand about the throat of the other.

The other hand rose, and with a queer semblance of preciseness, struck the small man on the side of the head. He went suddenly limp and Barclay released him. "Two hours," he said judicially, and leapt over to Belasco. He hit him also on the side of the head with the palm of his hand.

"Three hours, considering what you did to him, Pat," he smiled at the girl. "You took their attention away while I broke those chains. I knew the strength of the chains, and we always have to use double-shackles on Jovians. This is an ex-Patrol ship, and I know a whale of a lot more about it than they do."

Barclay drew Belasco's heat-gun, and his paralyzer gun, gave the heat gun to Pat, and took the paralyzer from the

guard. He looked at them hastily. "Hmmm—twenty shots in all, or ten minutes operation. I'll—"

He stopped abruptly as the heavy metal door shot up. Two men stood revealed. They had come for the body of the man Jennings had killed.

With a cry of alarm they sprang back, and brought their paralyzer pistols up. Barclay, moving three times as fast, threw a streaking beam across both of them. Suddenly one of the pistols exploded in a flash of light, then grew gradually red-hot. The guard dropped it as Barclay released him from the beam. In an instant Barclay's swift mind saw what it meant—the pistols were vulnerable to each other, some induction effect released the stored energy of one caught in a ray from another. The dropped pistol was white hot now, smoking and glowing.

From down the corridor came shouts and calls, pounding feet. The reenforcements were coming. "Throw me your pistol!" commanded Barclay, lowering his own ray till it paralyzed only the lower part of the man's body. The second pistol was thrown to him. An instant's glance told him it was full. He slipped it into his belt, and retreated to the platform.

A moment later a crush of pirates tumbled through the still-open door, and came with their paralyzers in their hands. Swiftly Barclay passed his rays over each, and one by one they dropped pistols that were swiftly heating to incandescence.

But from the door, a yet un-rayed pistol reached Barclay, and his weapons were suddenly growing unbearably hot. But they seemed to suck the paralyzing energy into themselves, away from the man, for as he hurled them from him, he drove like a bullet toward the man whose pistol had ruined his weapons. The ray caught him in mid-air, but so swiftly was he coming the man had no time to dodge, and Barclay's flying body knocked him down, the pistol flying from his hand to crash into wreckage as it struck the metal wall.

Then men began to pile on Barclay. But Barclay was a rubber ball. He bounced about the room with unbelievable speed, his flying hands merely slapping men, but leaving them unconscious for an hour, unless revived by outside aid.

There were twelve men attacking him, it took him less than forty-five seconds to send them all to sleep.

● Now he lost no time. Others were coming from other parts of the ship no doubt, and he had no more pistols.

"Pat—that pistol," he demanded. Without a word the girl tossed it to him. He whirled and shone a beam on a rivet-weld to one side of the heavy metal door. There was a crash, and the great metal slab fell into place as the rivet-weld glowed red-hot under the lashing heat-beam.

"Here's the gun—keep it, and cut your chains. Take care of them, collect their guns and distribute them among the other prisoners here. The door can't be opened from outside nor inside now, till the generators are stopped. This is a last resort for the Patrol men on the ship if mutiny occurs, or prisoners gain control," Barclay smiled broadly. "I'll be back."

He leaped toward the wall where star-studded space looked in through a narrow porthole, set deep in the double walls. He did something to the wall of the room, and a section fell back into the space between the walls. There was air here, air intended for those who might have to make repairs between the walls. But this carefully concealed door was a secret means of escape—and recapture of the ship. For now, between the walls of the ship, Barclay closed and re-locked the metal door-plate, and made his way along the ribs and braces between the two skins of the ship, climbing against the ship's acceleration toward the bow.

In a minute or so he rested on two cross-beams outside of what he knew was the pilot-room. A mass of cables lead from this room, back to the engine-room below. He could have entered the engine-room had he wished, or the ray-room. He preferred the control-room. Every outside room on the ship had these secret panels for emergencies. It was his own idea, and one Commander Morrison hadn't too heartily approved of. But it was proving itself now!

From an almost hidden clamp he extracted a screwdriver, rapidly manipulated it on what appeared to be a signal-junction box, twisted the leads to one side, and then pushed on a bolt-head. There was a sudden, subdued hiss, and a panel sprang backwards as the pneumatic cylinders drove it open. With a single bound, Barclay was in the pilot-house.

Jennings, cold-eyed, bent over the chart table, while Thad stared out of the pilot window, glancing occasionally at the meters and instruments on the board before him. A squat, powerfully built man was working over near the door.

The three turned as one when Barclay entered. Thad, with a trained, dexterous flip of his fingers threw the ship on to automatic control, leaped from his seat, and dove for Barclay. Jennings was whipping a paralyzer pistol from his holster, and the squat man was turning to do battle, his mouth opening for a bull roar.

It seemed like slow motion to the Jovian, while his motions seemed streaks of blurred light to the earth trained pirates. Barclay still had the long, sharp-bladed screwdriver, with its heavy insulite handle in his hand. The hand flashed up, and the screwdriver flashed across, to bury itself to the handle in Jenning's wrist. With a scream of pain the pirate-scientist dropped the weapon as the metal blade severed tendons, blood-vessels, and smashed through bone. It had been going with nearly the speed of a pistol bullet, and weighed nearly 12 ounces.

Long before Jenning's pistol could touch the floor, and before Thad had reached him, Barclay grasped the weapon in his hand, whirling in the air as he dove across the small pilot-house. The opened mouth of the squat pirate was emitting sound now, and a pistol was in his hand. Barclay trained his ray-gun on the other in a fraction of a second, and flicked a full-powered beam at it. In an instant a puff of smoke shot out, and the pirate dropped his weapon to see it burst into incandescence as it hit the floor.

From below-decks an answering roar was coming, and the pound of heavy feet. The squat man and Thad reached Barclay almost simultaneously. For some reason Thad had not been wearing any weapons, but now he clung to Don's paralyzer like grim death. The squat man attempted to uppercut to the Patrol Captain's jaw, but Don's head moved a fraction of an inch, and the blow whistled by harmlessly. An open palm struck the side of Thad's head, and the pilot dropped senseless. An instant later the remaining pirate bolted through the door—or attempted to. Barclay caught him, and a moment later he joined Thad on the floor of the pilot-room.

A glance assured Barclay that Jennings had fainted from loss of blood and pain. His hand reached up to a small knob to one side of the entrance-way and a heavy steel panel fell across the one door to the pilot-house, locking in air-tight gaskets. A moment later, and huge magnets had fixed it immovably.

Barclay leaped back to the pilot-board, seated himself swiftly, and threw on the powerful radio set on range 245-671. Swiftly, with nearly 1,000,000 horsepower backing his signals, he sent out a call to Wier, somewhere in near-by space, supporting him in this mad attempt.

"Wier—Wier—P.C+. 2500. Wier-Wier—P.C. 2500," he repeated monotonously, listening in his set.

● It became difficult presently as men began to work on the door. Meanwhile his other hand was swiftly altering the course of the ship, bearing back toward the Jupiter-Mars lane.

"Don—Don—P.C. 2500 answering."

"Temporarily in control here. Heading ship back toward Jupiter-Mars lane. Using spotlight beam and floodlight. Will start radio and leave it going as long as possible. Get direction and distance. Step on it. They're working on this door."

"P.C. 2500 coming," replied the radio set.

Don's flying fingers did things to the radio controls, necessitating considerable work to stop it, and much more work to repair it. But it sent out a continuous high-pitched note. Now he short-circuited certain resistances, and relays, and the ship staggered forward under a full Jovian gravity. There was an abrupt stoppage of work on the door outside, as the terrestrials fell down. Barclay grinned, and locked the controls as they were, adding some bits of wire to hold his shorts in place. Then he got up heavily, and with a tremendous effort walked to the door through which he had entered. From the other side he arranged it to close and lock in place when he released it. Returning, he released it, and watched it merge into the wall.

He returned to the pilot-table once more, seated himself heavily, and listened to Dave Wier's calls.

"Distance 500,000 miles. Approaching rapidly." Carefully Barclay altered the course of the ship's flight till it was pointed toward Wier's machine, and racing toward it ever faster. The tremendous acceleration was beginning to tell on the speed indicator.

Barclay glanced back at the door. A dull blue haze was forming about it. "Hmmm—distintegrator didn't stop working. Probably has a range of ten feet, and will hit that wall over there. I wonder—"

Barclay took two heavy bus-bars from the stock room attached to the pilot room, connected them swiftly, bending them over his knee. These he lead over, and set up like two poles close together in the necessary path of the distintegration machine's ray. The haze of ionization was growing stronger swiftly. By the time the two bus-bars were in position, there was a tiny pin-prick of blue ray flaming across the room, and a moment later scores of holes appeared.

Then two of them hit the bare copper bus-bars, charged with 150,000 volts. There were two wires. First the door, or what was left of it, exploded into flaming vaporized steel. Next the disintegrator exploded with a terrific concussion, raining white-hot metal parts all about. The machine had short-circuited the twenty-million horsepower generators of the ship, and the result was inevitable.

Barclay looked out through the hole in the door. One man had been badly burned, but the others had crawled laboriously down the hall and away from danger, when they realized that none of them could stand up to turn off the disintegrator and guessed what Barclay, who could stand the weight, would do.

Barclay laughed, and taking his paralyzing pistol, rayed first one then another of the men. Practically the entire crew had come to the defense of the pilot-house. The others had been working on the brig door. As one after another felt the ray, he slumped, and threw his burning pistol to one side the instant he was released.

Barclay's weapon had two shots left when he finished and returned to the cabin. No sooner had he crossed the threshold than from the ceiling above there poured a rain of the paralyzing rays. His fingers relaxed, and dropped the ray-pistol, which smoked slightly, but didn't explode, as all its charges were gone, his knees held for a moment before he toppled over and fell with a crash.

Joyfully the pirates in the hall hastened to crawl back toward the pilot-house, helping each other. Three made it, and promptly keeled over as they entered the paralyzing rays that filled the room.

Finally one of them crawled back and got a metal bar about five feet long. It took four of them to raise it into position and bring it down on the master-switch, opening it, and instantly shutting off all acceleration.

Then one of the men hauled himself back along the corridor to the engine room, and from the emergency engine-room controls, which were powerless as long as the master-switch was closed, but which now sent the ship ahead under one earth-gravity.

Gathering a brace of ray pistols from the bench as he ran up to join his friends, he watched them manipulating the metal bar again. It was easier now, and they quickly worked the half-hidden button that had flooded the room with rays. It was just over Jenning's face as he had lain there.

● His eyes were bright and hard as he watched. He was weak, and knew it, holding his right wrist with his left hand. But Barclay wasn't. The shutting off of the paralyzing rays had started him even more quickly than it had started his enemies. With a bound he leaped for them, burying himself in their midst. The metal bar was wrenched from their hands, and thrown across the room. Then the sixteen men who had congregated there got a taste of a Jovian in action. His terrible, flying hands meant certain unconsciousness, or broken bones, while he himself was an invulnerable mass of iron-hard muscle to their blows. The one on the outskirts of the battle who held the two pistols, hesitated to use them, they would paralyze friend and foe alike.

Presently Jennings saw them. "FOOL!" he shrieked over the noise of the fight, "RAY THEM ALL—FOOL!"

The two pistols shot out their beams, and suddenly the fight stopped, Barclay, and those near him fell helpless, those on the outskirts had not been rayed, and with a cheer, fell to pulling their comrades out of the melée.

"He sent a call for help. I couldn't read the radio code, confound him, but he called someone, and got an answer. He shifted our course till we were headed right for that other ship. We were traveling under that accelera-

(Concluded on page 604)

(Illustration by Paul)

Men learned once more to adapt themselves to nature. Camping in tunnels and cellars the poor emerged to pillage houses; like derelicts homeless men wandered the streets.

THE DEATH OF IRON

By S. S. Held

Translated from the French by Fletcher Pratt

● In this final installment, a reader will perhaps wonder what hope our pessimistic author holds for the human race. He has shown us its blackest side, and painted a vivid picture of despair.

But he has hope. His belief is not that humanity is hopeless but that it has used its gifts wrongly, and that with a new start perhaps a new order of civilization might arise.

These hopes shine through the last pages of this masterful installment; and we believe that our readers will be as deeply stirred as were the editors.

CHAPTER XIX
A Dying World

● There also one saw singular clocks without gears, wheels or bearings, and water-clocks in the Greek fashion vied with hour-glasses of all forms and sizes. There was even a giant hour-glass for the measurement of sidereal time—the time by which the dislocation of continents and the alterations in the stars are measured—and smaller ones for the measurement of the tiny spaces of human time, including an ingenious device for the pocket provided with an automatic mechanism for reversing the glass.

Selevine thought that the coincidence of two needles on a dial had become a familiar image which humanity would be some time in learning to do without. The conception of a closed cycle of time is inherent in the human mentality. At bottom is it not a summation of all man's knowledge, and indeed, of his conception of the Universe? "Yes," he remarked aloud, "Time is an old serpent who holds his tail in his mouth."

"Speaking of snakes," offered Wronsky, "I saw something quite curious here the other day. Imagine a needle with an interior tube which connects with a reservoir of venom. It is inoffensive in appearance, but more deadly than the jaws of the cobra. You speak of disarmament through the loss of iron! Go look at the War Booths—there are enough things to make any gentleman desirous of doing away with his neighbor hesitate for some time. Maces, clubs, tomahawks, cutlasses, lances, slings, arbalests and boomerangs are offered for your choice. And these names suggest the outlines of primitive instruments, but that really means nothing. The inventors of the new ones have merely been inspired by certain ideas.

"Everything too barbarous has been softened or modified. The devil, we are not butchers today you know. Between us and the savages there are all the gradations which separate the feline aristocracy of the animal world, who kill in a dilettante spirit from the beasts who murder only to satisfy their needs. Slightly muscled, all made of skin and nerves the man of today who thinks of a homicide finds the physical details revolting. The reactions that occur, the crude manifestations of pain, the cries, tears and blood shock his sensibilities.

"The methods of industrialization have become a part of his mental equipment, his education has been such that

WHAT HAS GONE BEFORE

In the steel foundry of Morain & Co. at Denain, France, there is noticed a progressive deterioration of iron and steel as though they have been attacked by some disease. This especially concerns Raymond Leclair, and Pierre Selevine, a Russian, two of the Morain engineers. Both men are interested in Renée the wife of their employer.

Several accidents occur in the factory, and the workmen become uneasy and fearful. The engineers are unable to explain the continual weakening of metals and machines. Police search radical organizations for the possibility of sabotage; but find no answer. One of the factory girls, speaking to Leclair, accused Selevine of being behind the strange disease, but she is not believed. But one day Leclair finds Selevine unconscious near one of the machines at a time when the engineer should not have been in the factory. One of the big cranes in the factory falls from its girders killing some of the men. The disease becomes recognized as "the death of iron" and seems to be spreading like a contagion. The steel manufacturers try to use the spreading trouble as an opportunity for a stock market coup.

Attempts are made by Morain to apply remedies to the sick metal, with only partial success. The disease is called Siderosis, and manifests itself by a luminescence of the metals, as though they were radioactive. It spreads throughout France, and everywhere workmen are killed by metal parts and by machines breaking down.

Morain is killed by a bursting boiler; and Leclair becomes the lover of his widow. France falls into a chaos of conflicting social groups and seems headed for revolution. Demagogues spring up everywhere to goad the jobless masses on to revolt. The military is called out and much street fighting occurs.

Leclair, managing the affairs of the widow, gets hold of a stock of proscribed metal; but is killed by communists while defending it. Then Selevine who had also joined the radical groups is wounded and comes to Mme. Morain for shelter. When he recovers, they start off together in a horse drawn carriage for Paris

They see, on the way, evidences of the collapse of law and order, with disease, bloodshed and famine everywhere. In Paris Renée goes to live with an aunt. Selevine, disillusioned, becomes a dope addict, and joins a circle of decadent artists and writers.

Attempts are made to keep industry alive with substitutes for metal. At an exhibit Selevine sees flint instead of metal tools. Wood and other substitutes are used. Glass needles and ivory instruments become common.

he tends to seek unconsciously the maximum of result with the minimum expenditure of effort, to avoid all that is useless, unforeseen or dangerous. The ideal would no doubt be the system of the Chinese Mandarin, to kill by pushing a button. In this case, however, the earth would be rapidly depopulated. Naturally, we haven't got that far yet, but we may hope.

"There, my dear fellow, you will find instruments due to the collaboration of the Amazonian savages who hunt for and preserve human heads, and the best engineers of the Polytechnic Institute; cruel little things which do their duty exactly, coolly and intelligently, and are agreeable to have around the house. Arrows can be carried in a cane, for instance, a needle-dagger in a cigarette-holder, poisoned needles in a glove, so arranged that you can kill a friend in the simplest fashion while shaking hands with him. They are selling slings that ladies can carry in their handbags and blow-pipes with half a dozen poisoned darts in the form of fountain pens. I won't bother to remind you about the lovely asphyxiating gases, the incendiary grenades, the corrosive liquids and disease germs you can buy. The pacifists rejoiced too soon over the destruction of iron.

"A tiger with his claws trimmed is none the less a tiger and man is not yet ready to renounce his classical coat of arms—that is, spots of blood on a Christ crucified. Ah, no! Means of destruction are not and will not be lacking and the military men still have a good many bright days before them. At least that is the opinion of General Fremont. You saw that he has demanded big credits for the army from the Chamber recently? A surgical instrument will do its duty even if it is not made of steel.

"In fact, war is the only remedy capable of saving the bourgeoisie now. A sacrifice of several million men is necessary for the recovery of Europe. The worker without work must disappear and battle offers a form of death whose pleasures have never been doubted in the best circles. Never have our politicians been filled with so ardent a desire to administer beatings to the sauerkraut eaters, the goddams and the macaroni jugglers. And the Germans are agitating for the same thing on their side of the frontier. The newspapers have been arousing the popular feelings most easy to arouse, and on the whole, it will not be difficult to drum up some reason for a conflict."

"The people will refuse to march," affirmed Selevine.

"Not at all. They will step out to get themselves killed with delight. While appeals to the brotherhood of man have encountered nothing but indifference and annoyance, the collective crime of war is always capable of rousing those great exaltations of the soul to the point of self-sacrifice of which the poets sing."

Selevine was unable to restrain a gesture of annoyance. Wronsky laughed.

"Good, I see the prospect annoys you. Well, let's talk about something else; the peaceful productions of the golden age following the age of iron, for example. Let's go see Silber and his squirrel-cage motors and intelligent dogs. After all, who knows? Perhaps I'm wrong and he will have the last word after all."

● They walked on for a while, arriving before a door which the Pole pushed in without ceremony. Selevine saw a man of uncertain age, bald, with a broken nose and uncombed beard, clothed in a sort of shawl made of fur. He seemed intimidated by the presence of his two visitors, but Wronsky put him at his ease by talking about his inventions.

"Machines without metal for boring, polishing, threshing grain, weaving, all utilizing animal energy," he explained in painful French. His dirty nails ran over the wheels of fibrite, the wooden connecting rods, the bearings in greased stone. Showing them the faults of the early models he had there in his workshop, he excused himself for not being able to demonstrate his latest and most interesting creations. Aided by his wife and his son—"a child of fifteen, gentlemen, but always the first in his classes"—he had constructed machines whose power was furnished by a kind of pocket menagerie.

At present he was measuring the strength, production of energy and fatigue point of a dog in a rotating drum. His face exhibited a mixture of ingenuity, misogyny and charlatanism. As Selevine understood Russian the conversation was carried on in that tongue, and according to the habit of the sons of Abraham, the inventor trailed off into generalizations

"The suppression of metal is obliging us to make increasing use of muscular contractions, and the brutal energies developed demand resistant organs."

"But the output of energy from animals is very small," protested Selevine.

"Evidently. Man needs to reduce his pretentions, that is all. We shall move about more slowly and carry less heavy burdens. A simple change of scale. In a century the new habits will be formed and no one will think them anything but normal."

"And you are studying the properties of muscle?"

"More correctly, the methods of utilizing it in such a way as to produce the maximum effect with the minimum output of energy. Organic movements are complex, varying with the weather and other conditions; the periods of useful labor alternate with others in which preparation is necessary. Our machines, generally speaking, envisage rotation in a continuous cycle. Now the intermediate stage between these two types of action must be established. Up to the present nothing useful has been accomplished in this direction, except for the bicycle. Look what man can accomplish with this simple machine, having no other resources than his own strength. Then you will understand what enormous fields of action lie before motorized muscle."

Then with a smile that somehow made him look oddly younger, he told of his great hope, the dream of his existence—the invention of an avicycle, an airplane without a motor.

"What did I tell you," said Wronsky, as the inventor stepped out of the room for a moment, "He's full of ideas that chap. Too bad, he's such an unsociable creature."

Night had fallen. Trembling flares illuminated the scene around them. A group of visitors arrived, all acquaintances of Wronsky's. Very young for the most part, students or sportsmen of the days gone by, they now made their livings by various expedients, trafficking in different articles. They were not at all interested in women or politics, but discussed business and sport with the same passionate interest they would have devoted to automobiles a few years before. The talk took a horsey turn.

Fragments of the conversation floated to Selevine's ears—"Fifteen an hour—" "Albien's ponies, you know the pair, Wronsky, those two marvels of his. Well, they have been requisitioned by the sanitary service. It seems there's a lack of anti-Siderosis serum and they're requisitioning all the horses. How the devil will the President drag his three hundred and fifty pounds of beef from his home to the Chamber?" "Just imagine him in an ox-cart, like a Gallic chieftain!"

Everybody laughed

Seeing that Wronsky was surrounded, Selevine seized the occasion to escape.

The crowd bored him. He felt himself an utter stranger to this younger generation and its occupations. The idea that the world, even damaged as it was, was going to turn in a direction he had never imagined, was somehow painful to him. He did not like to think of the new aspect of things and preferred to ruminate various projects of despair. Was not the future dead for him in every sense?

He wandered about for some time, and ultimately, exhausted with fatigue, lay down on a bench by the riverbank. The air was filled with the scent of rotting things. A boat went by, avoiding the ruins of a bridge. The shadows covered the city, inert after its rude labors of the day. He had the illusion of being the only person awake, a sentinel watching over a sleeping world. A star came out in the sky. With an association of ideas, he thought of the Blue Evil and his eyes rested on the ruined bridge. In the shadow the girders seemed covered with a silver leprosy and about the ruins, which still retained the essential lines of the structure, there was something ferocious and convulsive. One seemed to be looking at the liberating effort of metal upon itself, seeking to break the bonds of form imposed upon it to return to the primitive state from which it had issued.

● Selevine thought he perceived here the revolt of matter, the march toward universal negation of everything on which man had imposed the mark of his mind. All was sinking, vanishing, disappearing into the maw of time. Soon the whole unquiet race would disappear and its works would be effaced like those of a burnt stick. And it seemed to the dreamer that he saw the future toward which humanity was evolving. Aye, he saw centuries hence, the cycles turned, the cities deserted. A few debilitated tribes wandered over the mineral earth where animals and then the plants had died out. Around him the picture in which Keller had rendered the grandiose melancholy of universal death was almost materialized. And the hope of winning this incoherent race, deaf to the menace of the future, back to logic and sense seemed to him foolish.

An approaching passerby broke the thread of the Russian's thoughts. The sense of his own misery, of his irremediable isolation, swept over him. He envied the sleep of the animals who are untormented by thoughts. He evoked confused pictures from the abysses of his memory, and then his thoughts returning to Renée, he was oppressed by the presentiment, the certainty of her approaching death. He represented her in his mind's eye in various attitudes of torment and pleasure, then struck down by the malady, controlled by the spasms to which it gave birth—and a terrible peace seized upon his heart.

A man had seated himself on the same bench, and without perceiving who he was talking to, Selevine addressed him:

"Pleasure vanishes as soon as we touch it. Only pain has genuine existence. The best we can do is try to draw some pleasure from suffering. God has not made us otherwise."

His neighbor regarded him silently, then seeing that the Russian was not dangerous, he confided:

"I was a sluice-keeper at Rosny. . ."

His ingenuous eyes lit up beneath his heavy eyelids, and an amiable smile cracked across his old, wolf-like face. He went on:

"There are no more sluices. I worked in a cork factory for a while. But at Paris this profession doesn't amount to anything. It's all the fault of that damned Blue Evil. We are overwhelmed by foreigners here, the dirty pigs."

Leaving his residence several days later, Selevine ran into a line of troops. Every street, every bridge-head was held in force, for the news of the Toulon mutinies had just come in and the Communists were active in all the laboring-class suburbs. Sailors had deserted the battleships and soldiers had fired on their officers. The principal movers in the revolt had been executed at Paris after summary court-martials. Whether through feebleness or malice, the government had turned the bodies over to the families of the executed men.

Selevine's indifference to life disappeared. Perhaps he by processions of proletarians, public women and Neo-spiritualists. Cries were raised—"Death to civilization! We want absolute liberty!" They called for the creation of a new ironless city, an Atlantis. A kind of priest lifted above his head the emblem of the new sect, a starry globe enclosing a representation of the original meteorite. There was a little silence and a young woman intoned a song—the Chant of the Slaves of Iron—with passionate intensity. The forbidden hymn escaped like a defiance from the breasts of the oppressed. The whole crowd moved with a single emotion. Women grovelled in the dust, others tore their clothes.

Selevine's indifference at life disappeared. Perhaps he remembered his comrades of the barricades, carried along by the stream of his own eloquent words . . . and a chance push suddenly precipitated him among the horses of the Black Guard. His hypersensitive eyes distinguished a blue mark on the iron of a sabre brandished above his head. Horses began to throw their riders. A gas bomb exploded. Selevine breathed the poisonous vapor, felt suddenly stifled, blinded by dust. Then the eddy of the crowd which had pitched him out sucked him back again in the swirl of the panic.

After this incident the government reinforced its measures of coercion. Nobody could carry on the most ordinary business of life without a card of identity. Actions against foreigners were begun, the laborers brought from Austria and Poland being the chief sufferers. Difficulties of transport had prevented the repatriation of these miserable people on the evacuation of the North. They lived in camps, in surroundings of incredible beastliness, living on garbage, devoured by vermin, the horror of the nearby inhabitants and the despair of the sanitary authorities. They were ultimately pushed pell-mell to the frontiers by the troops and there at last they received permission to die.

The Communists became the object of the strictest sur-

veillance. Police spies were everywhere. People lived in continual fear of an anonymous denunciation.

Toward the month of October there was a change in conditions. The government began distributing provisions, but this measure, which was begun with the best of intentions, had the worst of results, for its only effect was the ruin of the small shopkeepers. At the same time the difficulties of all forms of transport became acute. The Reconstruction Trust went bankrupt and the possibility of a Franco-German war began to be discussed. At this date the exodus from the cities began. A sure instinct urged men to fly from the constricted spaces where interest and not brotherly love, had caused them to gather.

● Infinite wisdom knows how to place in the heart of the unbeliever the instruments for his own punishment. Selevine felt keenly the pangs of a disease he had never before experienced, the agony of approaching extinction, of death, nude and without disguises. He had attained, by the route of logic and doubt, the abyss foreseen by those who bore the intellectual torches in advance.

He found a harsh satisfaction in observing the vanity of all effort, the incoherence of life when it is aggravated by hypocrisy and hatred.

The presence of Renée alone could give him relief from his thoughts. When he was with her everything was peace, tranquility and silence. Stretched out at her full length, her figure still preserving the lines of her youth, she seemed to sleep, overcome by successive waves of pain. Her eyelids were half-shut, the nails of her thin fingers gleamed among the shadows like the jewels she wore. Mme. Lafont sat near, shrivelled in her shawl, with bright eyes in a face of wax. There was a discreet perfume about, a perfume attuned to these shadows, these veiled lights. In its presence Selevine felt his pains mysteriously decrease. The world and its agitated tribe of ants fled from his memory and the only reality was the sick woman's room, where every detail possessed an infinite importance. A sort of torpor came over him.

Excesses of every kind had definitely ruined his health and taken the edge from his intelligence. All physical effort had become painful for him, and mental effort, except the passive effort of reverie was hardly less so. He drifted easily into fantastic atrocities of the imagination.

An involuntary movement on the part of the sick woman exposed a ravaged shoulder, beneath which the too-tired heart slept and the fever of her worst days burned again. Suffering and passion inspire the same attitudes in women. Selevine imagined himself lying at her side, regaining the purity of his youth by the mere contact with the white garments she wore. She resembled the murdered girl he had seen and whose appearance had stirred him so strangely. Both of them haunted his sleeping hours, the one extending her lips the other her murdered arms, with laughs that resembled sobs. Something in their attitude froze him with terror.

One night he dreamed that Renée was dead, but he had the impression her death was an event to which a long series of years had habituated him. Although resigned, he kept hoping against hope, awaiting some event which he both feared and desired. A form advanced toward him and his heart began to beat while his whole body tingled. He could neither fly nor turn his head. Then suddenly, he comprehended that Fate was vanquished and that he, by an effort of his will, had wrung from Time the prey it had already swallowed. The miracle had absorbed all his strength and he thought the event had perturbed the laws of the universe, including the very equilibrium of the heavens. "It is she, it is Marguerite," he said to himself, repeating the words of Faust when he had been possessed of superhuman powers and evoked the beloved shade in Walpurgis:

"I recognize that slender and graceful form. I recognize the line of blood around that white neck. It is she, it is the sweet face the lovely body I have desired."

But as she approached her appearance was modified. He saw beneath the greying hair a visage marked with dabs of blood, and eyes so filled with madness that he cried in horror, "Go! Go!"

In his efforts he dreamed he opened his eyes and sat up in bed, but that Renée was still there. He saw her once more at the factory, amid the shrieking metals, the furnace breaths and the red masses of beaten iron. His secret burst from his lips—"Listen, *it was I who found and propagated the first germs of the Blue Evil.* I lit the fire which is devouring the world; I kindled the flame which is burning you," and he implored her pardon in a fury of repentance.

He found himself suddenly transported into a magic land where hills of coal limited the vision beneath a black sun which rolled in a vault pierced by holes through which the stars glanced wanly. A phosphorescent mist tarnished the desert spaces in which perpetual silence reigned. "It is the unrevealed face, the negative of the universe," he told himself, emerging from sleep.

Where had this memory, this incomplete fragment of knowledge, this deceiving charm come from? Shadows of what might have been, discolored images. The days of his own youth passed before his dreaming eyes. He evoked the snowy distances and black trees of his own country, and would have taken Renée there; in his imagination he had lived with her there for long years. Turned in upon itself, his mind exhausted his own strength as a hibernating animal lives on its fat, and he reached the point where his mind refused to give him any further consoling visions.

Material preoccupations came to add themselves to his moral torments. His financial resources had diminished and he was tortured by hunger as well as by the deprivation of his favorite drugs. At one period he attempted to find work. As he had expected, his efforts were futile. Being without a government connection, he could find nothing but the most degrading tasks. He even haunted the forges where men were hired to handle the scraps of diseased steel, but his appearance brought him nothing but a series of rebuffs. Too weak now to think of leaving France, he abandoned himself to his inevitable fate.

The month of December drew to its close. A sharp cold spell followed snow-squalls. Long lines of the poor formed in front of every place where there was room for them to sleep. Markets were pillaged, storekeepers murdered. Each in their turn, the government, the middlemen and the unemployed were blamed for conditions. Foreigners, Jews and vagabonds were persecuted. In the common misery all pity was banished.

One evening a street-gamin brought a message to Selevine from Mme. Lafont. Renée's illness had taken a turn for the worse and in her distress the poor old woman did not know where to look for help. The doctor Selevine summoned shook his head over her. As she was suffering,

he gave her an injection of morphine, and she passed insensibly from the temporary sleep it afforded to the permanent sleep of death.

EPILOGUE

A New World

● Separated by racial prejudices, but victims of the same necessities, modern nations are economically interdependent. All social progress, all evolution damages the common interest when it attains beyond the common level. As among individuals, an overwhelming superiority of genius or fortune is intolerable. The statistical curves and their tendency are the same for all countries—they converge in the direction of a straight line, and the future and the unforeseen are perishing from an earth embellished by the progress of mathematics. The generations of the future, having disposed of the uncomfortable burden of intelligence, will be able to attain the happiness of a mechanical society which has been definitely regulated.

But the Blue Evil, by destroying industry, compromised this beautiful vision of the future. A few years were sufficient to hurl down the whole "edifice of progress," a piece of composite construction whose ruins went to join those of the ancient ages. The equilibrium which menaced the mind of the race with sterility gave place to something unstable and heterogeneous, the only thing capable of drawing new creations of the mind out of the crisis.

Peoples no longer communicated with one another and evolved in different directions. The unity so elaborately constructed was shattered. For this reason the history of the Post-Metal Age is in many respects like that of the pre-metal ages.

Amid the immediate confusion certain tendencies were felt at once.

Nations carried to their logical conclusions the measures which had disarmed the weak and the perfected inequality of the modern social structure attained the grandeur of a state religion, for whose principles there were even martyrs and monks. Others, on the contrary, wished to redress natural deformities in a thorough-going manner and sacrifice the individual to the mass, a procedure which caused all to partake of the same miseries without sharing in the same joys; others still wished a liberty without any bounds, and the dispersion of crowds.

The peoples of India and China went rapidly toward complete anarchy. Collectivism triumphed in Germany and England, but with different characteristics. America and Japan, as yet little touched by the *Siderosis*, gorged themselves with the spoils of Europe at the risk of being stifled under their own acquisitions. As for France, the country of order and good sense, the preferred home of the wealthy of all nations, it amalgamated the traditions of various political systems according to the national genius.

Torn by civil conflicts, without arms and without warships, her industry ruined, staggering under the burden of enormous debts, she still had a certain influence in the world. The gold which had fled from her banks took refuge in old socks and teapots, and from this invisible prudence there radiated an influence which warmed chilled hearts.

An attempt was made to recuperate certain metals by sterilizing them with fire, then storing them in silos protected by lead sheeting. But the flowers of the Evil attacked them before they had become cold. The waves penetrated the interior of the ground, rotting the minerals and all the other treasures of the depths.

By way of the submarine cables the Blue Evil crosses the oceans, with its factories of reinforced concrete, its ports filled with ships, its street congested with vehicles, its multiple workshops, machines and bridges, America in turn felt the victorious march of the plague.

The shortage of manufactured products engendered bitter economic rivalries. England and the United States disputed acrimoniously for the precious metals, coal and wood. The Germans inundated the world with special alloys whose use provoked grave disasters. It was then that the patriotic campaigns begun by certain newspapers on the occasion of a tariff conflict produced their result in a new world war. The order for mobilization was voted in France by a narrow majority of politicians anxious to give the people an outlet for their fury. The concentration of the army was effected in indescribable disorder; the soldiers were undernourished, discontented and exhausted by the first forced marches they had to make.

Acts of indiscipline were quickly followed by murders of officers. Entire regiments mutinied and passed from mutiny to rebellion. Masters of three frontier cities, the insurgents began a march on Paris. The government confided the defense of the capital to General Felder and the assailants were repulsed.

The cruel fantasies of this dictator started bloody factional conflicts which ended by plunging the whole country into famine and civil war. He was assassinated and two chiefs of the popular party came into power. Their first victims were their own comrades and the passions they released were long in dying down. The "Central Council" promised to bring back order, work for all, and supplies of food. The unemployed were forcibly enlisted in a labor army. Great works of public utility, including the foundations of the new Ironless City were begun.

Nevertheless, the demobilization of the armies was slow. German deserters made continual incursions into French territory. Famished military bands roamed about the country, attacking lonely women, giving vent to all the excesses which men assured of their own immunity can commit. Resolved to defend their belongings, the harassed villagers answered murder with murder. The regular troops found streets barricaded against them and wells poisoned. Those who went out in small parties never came back. Human life lost all value. Districts organized themselves as intrenched camps refusing to submit to the central government.

Little by little the reign of factions gained complete control; all France broke up into tiny morsels. The primitive forms of administration necessitated by the growing paralysis of all means of communication and exchange came to the fore. The tendency toward agglomeration which had characterized the industrial age was thrown into reverse by the operation of the Blue Evil.

But this tendency did not dissolve the difficulties of the situation. If some districts enjoyed a relative amount of security, it was only because they submitted to the tyranny of local "Councils." The whole people longed for deliverance, but such was the general lassitude that

the labor dictators were able to retain their power for three years.

● No ship any longer plowed the deserted seas. Only a few fishing barks, made of planks held together with wooden pegs, ran along the coasts. The radio stations were long since gone and the electric cables, the last nerve-fibers uniting the vital centers, broke down one after another. The plowshare and the axe rusted away; the needle broke in the hand of the seamstress. The instrument, the machines, all the antennae which completed and prolonged the human senses, were irredeemably lost or broken.

Men learned once more the lesson that the body is fragile. They adapted themselves to circumstances, but now they were no more than rather inefficient animals in the wild forests of the world. The complexity of modern existence, the interrelation of every fact, and their influence on every domain of life, precluded any possibility of the reconstruction of civilization. Specialization and the interdependence of organisms—those master-products of modern society—brought about the fall of the entire structure through the failure of one of its parts.

The great cities, monstrous tumors of materiality, concretions of stone and steel on a sterile soil, were the least spared.

Stocks of cereals and combustibles were quickly exhausted. Camping in tunnels and cellars everywhere, the poor emerged to pillage the ruined houses and tear up wooden sidewalks. Like derelicts carried along by some invisible current, homeless men wandered through the streets.

All efforts in the direction of improvement broke down on the lack of agricultural instruments. When winter came, the aged, the weak and those without resources perished. The skeleton corpses of peasants were found stretched out in the fallow fields, their mouths filled with the earth that had failed to support them. The workless who had left the cities came flooding back, demanding food.

Paris saw villagers arriving, pulling their handcarts or carrying skinny children, wanderers clothed in rags, their feet torn, scorbutics who could have been blown down by a breath.

Corpse robbers were recognizable by their furtive air and their appearance of hunted animals. Those who had been captured by the peasants were nailed alive to trees.

For the first time in four centuries wolves in great numbers appeared in France. They came from the Ardennes, the Black Forest and still more distant haunts, following the track of the Great Famine. Their indefatigable hordes converged in a single direction—the South, toward which they were drawn by some inexplicable instinct. High in the heavens soared birds of prey.

Over the frontiers, also, surged a horde of famished creatures with limbs more rigid than dead wood and bodies devoured by ulcers and vermin. They came from Austria where a whole people was perishing amid terrible contortions, from the Polish ghettoes, from sanitary camps (those centers of hate and despair) and they marched on without paying any attention to the bodies with which they sowed the roads, in spite of hunger and cold, in spite of the ferocious animals and still more pitiless men. Nothing could halt this current of life which did not wish to die.

By instinct they moved toward the cities where there were still stores of provisions. Paris was the center of this movement. Works of defense were hastily thrown up. Guards watched at the gates of the city while these specters, whom walls could not halt, marched on to surround them.

Already, germs brought in by the immigrants had engendered epidemics of strange diseases. Among the ruins and rotting corpses of men and animals, rats roamed about carrying bacilli. Water escaped from the conduits and terrible fires devoured whole cities without being checked. Not a day went by without some new crime or horror coming to shatter the nerves or arouse sleeping ferocities.

All constraints—law, morals and wisdom, were removed. And as the common people slipped into mere beastliness their masters showed the disquieting visages of maniacs and scoundrels, unmasked and unashamed. It seemed that the Blue Malady was sapping not only the physical vitality of organisms but consciences as well.

There were brawls everywhere. Men fought and killed, not only for necessity or to gain booty, but out of a mere taste for killing. The weak gathered around those who had strong muscles and intrepid characters. With the coming of night everybody barricaded himself in his house while a multitude of vagabonds raced through the streets committing the worst excesses and laughing at the police forces.

Certain of them acquired a sinister renown, and accomplished deeds that seemed like those of some savage delirium.

Nobody knew the number of these night-raiders or where they lived; with the close of day they issued suddenly from their unknown haunts to murder and violate.

● In the middle of the night there were cries, the sounds of battle, the galloping of a horse. A flame would burst out somewhere, hurling back the intense shadows. The militia, running to the spot, stared stupidly at the flaming houses, the rooms with their doors broken open, the corpses of children among the bloody ruins. Women disappeared to be found later in abandoned fields or at the edges of rivers, their bodies mangled.

Several of these "chauffeurs" (the old name still hung about them) were caught and executed without quieting public opinion. These events increased in number. At last, in a great drive, some hundreds of the bandits were seized at once. They were discovered to be, not people of the lowest classes, but the élite of society. By day they moved about the streets quietly and soberly. No marks of insanity appeared on the faces behind which such horrible plans had been formed.

Those who judged them were astonished at the serenity with which their victims heard the sentences which condemned them to death. Nobody was capable of understanding these artists in death who had wished to draw unforgettable aesthetic pleasures from the sufferings of others. They were the children of an age which had rejected the Absolute and scorned the Ideal, and they had sought these infinite needs of man in impossible horrors.

The executions were numerous, to the great pleasure of the lower classes. They seized the miserable bodies from their guardians and tore them to pieces. Grimacing faces watched the process avidly and those who could not take part in these delicious public murders watched

them with eagerness. The executions roused wild and savage cries of excitement in the mob which, overwhelmed by the pleasure of the moment, spread through the city for battle and pillage. It was with difficulty that horsemen broke them into little groups and beat on their heads with loaded clubs.

Finding the operations of justice too slow for their taste the citizens demanded a pitiless supression of such movements and sought to bring it about by extra-legal means. Secret societies, anarchists affiliated with the ravagers, embarked on obscure machinations, sowing the germs of contagious diseases in various places, poisoning rivers, setting fire to private and public buildings. Sinister tales passed from mouth to mouth and aggravated the universal suspicion and fear. To get rid of your enemy, you accused him of murder. A chance resemblance, a sign wrongly interpreted, would cause the crowd to hurl itself on some inoffensive stranger.

Man hunts were organized with enthusiasm. Every telegraph pole and tree bore its fruit of hanged men. At the corner of the street one found a corpse with a shoelace tightened around its throat, its limbs broken, its throat cut, or emptying its brains into the gutter.

But all other dangers and terrors were quickly forgotten in the arrival of an epidemic.

A contagious influenza which had its origins in the Asiatic lands and among the peoples of Galicia, traversed Austria, ravaged Germany and at the moment of its greatest violence, reached France. In the laboring class sections, the poor, debilitated by undernourishment, were soon dying by scores. The frightful days of the pestilences of the Middle Ages returned. The fever produced by the disease was high, the exhaustion following was profound.

The sick person died in one night, delirious. Those who resisted the disease were soon carried off by the complications which the enfeebled organism was unable to beat off. In some particularly severe cases even the medicines were turned to poison by the effect of the germs. Worn down as it was the entire country submitted to the attack of the destructive forces without being capable of an effort of recovery, like some great body plunged in a coma. The hospitals were gorged with the sick and all medical stores were exhausted. Without interruption the funeral processions passed through the streets.

The excess of misery and the fear of the contagion provoked cases of dementia and collective suicides. Every day the Seine threw up on its banks green and swollen bodies. When the warm days came a poisonous slime appeared at the bottoms of cisterns and pestilential odors filled the city.

The shadow of the plague stretched over all France, stifling the last sounds of effort in wails of despair. In the deserted streets only a few masked hospital attendants were to be seen, carrying bodies which were taken to the suburbs to be burned in great heaps. The contaminated ruins of the poor quarters were likewise deliberately destroyed by fire. For a whole week a ruddy light never failed to illuminate the sky on the side of St. Denis, where the clocks were still striking the hours.

The vaccination centers, the ambulances, were demolished, and troops of people fled from the city. On foot, with hardly a rag to cover them, they dispersed along all the roads, disputing for inedible scraps of food, while the villagers locked themselves in or brandished grim clubs beside their growling dogs. As the plague spread the hatred of every man for his neighbor grew apace.

Sometimes a hospital convoy approached the Seine. The last weakened bridges were blown up, and all boats fled to a distance. Those who looked on the spectacle contemplated with horror the black faces of the dead in the tragic river.

Eventually the contagion extended over the whole world and dominated every other thing. Fear exercised its dissolving action on consciences and from that moment the last ties that kept down the beast in man were broken.

● Along the unused highways vegetation began to pierce the stony soil and cover the denuded places with a verdant tapestry. The useful plants perished, fruit trees returned to their wild state, hedges became impenetrable thickets in which birds built their nests. Insects foraged among the stones man had worked to his will. Ivies and lianas moved prudently over the statues, taking possession of places hitherto forbidden to them, while a thousand little animals, seriously occupied with murder, nourishment, love and home, ran about. But in the ruined cities the green things still refused to grow.

The water of the heavens washed the white walls of houses which had become great sepulchres. An instinctive terror kept living things away from these desolate places where the bodies were gradually dissolving and where the radiation from the rotting irons produced incurable ulcers on the skin. Only a few ravens built their nests there and a few dogs, strong and wild as wolves, lit the nights with their prosphorescent eyes.

The elements had not yet worn down the granite and the moss had not yet covered the nudity of the constructions of stone wrung from the earth. A heart-rending tranquility emanated from these cities of the people of the metals as the soft lines gradually covered the evidence of their last convulsive effort.

Immense skeletal structures were still to be found there, bushes of tangled wires, columns split like trees by bolts of lightning. Sometimes, with a crackling sound, a pylon would collapse and a dust of rust and cinder would rise; then the silence would fall once more.

After the great epidemics all sound men had fled from these charnel houses. Dispersed throughout the world, enfeebled, discouraged, they despaired of reconquering the metals which had made them masters of the globe. Their mortality-rate was high, for sporadic forms of the contagious diseases were still abroad. The most cultured, being the least adept in the combats of primitive existence, were the first to perish.

As though crushed by the struggle, man permitted Nature to shower blows about his head without attempting to defend himself. The elements beat upon him, the uncultivated ground refused to nourish him, the animals, seeming to understand his fall, became less timorous and asserted their rights to existence with energy. Dogs, which had become accustomed to attack men, followed the trails of the caravans and silently tore out the throats of any laggards.

Returning once more to the ancient means of defense, the people of the villages made great fires and armed themselves with spear and hatchet of stone. They constructed dwellings of wood caulked with ✱ crude cement and carts whose wheels were sections of trees. Some emigrated to more fertile countries, guiding themselves by

the stars, after the manner of the ancient navigators, avoiding traps, digging out canoes, and chasing wild animals. Others replaced the steel plowshare by flakes of flint and forced the unwilling soil to produce a scanty wheat. In France, tribes which rapidly forgot civilized customs grew up. The river-dwellers built huts along the banks and in the plains men constructed towers connected by walls strong enough to resist the attacks of marauding bands.

Nomads, driving before them their herds of horned animals, moved about at random, exchanging skins, fishhooks and vases of clay for the crude bread the agriculturists made of their wheat.

These degenerate descendants of the conquering races showed definite signs of regression and lacked the vitality of the primitive tribes. Fear and defeat had made them somber. Incapable of any sustained effort, irresolute in their actions, they lived the opportunist existence of the hopelessly misfit. Their fitness for survival had declined and already Nature was considering their extermination through her inexorable processes.

The warrior instinct, that source of all the virtues, through which the youth and health of a race finds expression, had been extinguished. They no longer enjoyed fighting and if they killed, it was in a manner without peril to themselves, attacking animals asleep or women and children. Their passions were as debilitated as their bodies, their tendency toward indecision, toward useless cruelty and indolence. Chimerical fears haunted their minds. They had forgotten how to pray, but a kind of complaint escaped them from time to time when they were more than usually oppressed by animal agonies.

Some of them possessed fragments of iron, which they venerated as though it were a fetish of some kind. Little by little the idea of the "Metallic Entity" grew up among them, as a kind of god and the source of splendors beyond the imagination. New religions, based on superstition and bloody sacrifices replaced the ancient beliefs. The cult of stones was reborn. Their ancestors had known that a stone of some kind, fallen from the heavens, had been the cause of their own decline, but they had almost forgotten it. The tradition survived only as a kind of vague terror mingled with admiration. Man was once more drinking at the sources which had nourished his infancy.

Humanity had lost all community feeling. The displacement and interchange which had agitated individuals from their childhood to their death, which had produced new races, had disappeared. No discordant echoes troubled the immobility of vegetable and stone.

In a world of diminished resources millions of individuals had perished. The survivors followed their ways almost on tiptoe, across places where the brilliant glare of metal burned no longer. They belonged to a less prolific race and one with a taste for contemplation, a horror of noise and movement. An irremediable disappointment veiled their eyes and they had forgotten how to smile.

Once the last combats were over and the epidemics extinguished, they discovered the bitterness of their own condition and regretted the past of their race. The need of doing, the thirst for creation woke once more. Nothing could satiate this ache, but they searched for means other than material ones for the new types of expression.

The stimulating action of the struggle for existence had ceased to exist. Work and play, have they not their common origin in man's necessity for escaping from his own thoughts? The new race, incapable of breaking its hereditary habits or of really adapting itself to changed conditions learned all the horrors of reflection.

Eventually the nomads made drugs which dispensed funeral pleasures and gradually deprived the takers of strength. Death, beautified by poisons had a corrosive savor which very few of this desperate race could resist.

Some of them also perished suddenly without any signs of organic decay. A profound lack of energy marked these sons of a vanished civilization who could not enter the road to a new type of life. For them the cycles of progress had ceased to revolve. But others, who were marked by invisible signs, prepared in curious ways a soil fit to receive the seeds of the future.

One sect of fanatics preached the return to a vegetative life, the negation of form, the denial of physical perceptions and even of knowledge. Religions rich with Oriental quietism exalted the Nirvana, their agents destroyed the last vestiges of progress, sacked the villages that had been rebuilt with so much effort. The fortified towns were given over to barbarisms and disappeared, while other places became the scenes of group murders in moments of erotic frenzy.

Men suffered from torments previously unknown, and heard once more the voice of fear that had been drowned by the noise of the cities. Aspirations unsatisfied by the spasms of the body and the cold drugs of religion wandered wildly. The Cabala and necromancy were reborn. Numberless theosophists, magi, demon-worshippers and occultists, princes of a kingdom of shadows and illusions, rose in all the corners of the earth. They evoked forms situated beyond the realm of physical perception and produced incredible phenomena.

Who can tell how these aberrations reached their ultimate result—through slow evolution or sudden bounds of progress? But there was ultimately an alteration in the form of human mentality.

Time rolled on, destroying the last vestiges of ancient labor. Generation succeeded to generation while the practical interests and preoccupations of the ancestors became incomprehensible. Interpretations of the subtle forces of intelligence changed; elements never before employed, latent forces, gained the mastery.

There was an extraordinary development of intuitive perception, a drift toward a mysticism in which both formal intelligence and the blind instincts were destroyed, a contraction of thought which rose out of the mind of the race to identify itself with life.

Philosophers already saw the dawn of a civilization which had no element of the mechanical; and the creative energy of the mind entered the domain of the supersensitive, almost the supernatural. There appeared new modes of thought, engendered in the course of evolution, to satisfy the conditions of environment and the exigencies of life; modes of thought altogether different from those that had been supposed the only ones possible.

. . . Positive science explains the diversity of things and relates them to known facts. It discovers the relation of various phenomena to one another but never their reason for existence; it is an instrument imposed by the necessities of material action and its use supposes the imperfection of the senses. Through its means we can perceive only a small portion of the world. But the soul, the interior abyss which is the home of the infinite, con-

tains things which the intelligence can never explain. It has gathered all the experiences, progress and conquests of life, but these stored treasures are perceived only across a veil of shadows. Yes, one day man will free himself from matter to search for these treasures.

THE END

PRIZE WINNING LETTERS

September 1932, Cover Contest

● IN presenting the prize-winning letters of the September cover contest, we might remark, first of all, on the similarity between the first and second prize letters. Not only are the ideas fundamentally the same, but also the phrasing is similar. Perhaps both prize winners consulted the same reference sources.

The idea of diffraction rings as an explanation of the cover is convincing; but the prize winners failed to account for the colors of the rings in the cover. Such diffraction rings if they are formed from light such as sunlight, would be colored, for the sunlight would be broken up into its spectrum.

The difficulty with the explanation of Mrs. Wyman is that the waves formed on the oil would not become progressively wider, but would remain for all purposes uniform in width (or wavelength). However her explanation was ingenious and merited the third prize.

The fourth to tenth prize winners, who are awarded a year's subscription to WONDER STORIES or EVERYDAY SCIENCE AND MECHANICS, at their discretion, are listed in the box. Their letters are not printed, but they ranged in subjects from an explanation of the cover as a symbol of "infinite knowledge" to that of an ordinary spectrum.

1st Prize $15.00—Milton Kaletsky, 2301 Morris Ave., New York.
2nd Prize $7.50—Maurice J. Baruch, 881 Fox St., New York.
3rd Prize $5.00—Mrs. George H. Wyman, 236½ N. New Hampshinre St., Los Angeles, Calif.
4th to 10th Prizes (a year's subscription to Wonder Stories or Everyday Science and Mechanics at the discretion of the winner).

J. Harvey Haggard, 940 5th St., San Bernardino, Cal.
Forrest J. Ackerman, 530 Staples Ave., San Francisco, Cal.
R. C. Mainfort, 305 Braddock St., Alexandria, Va.
Mortimer Weisinger, 297 Lexington Ave., Passaic, N. J.
Charles Greenleaf Bell, 1603 Washington Ave., Greenville, Miss
John B. Bockelmann, 44 Fairview Terrace, West New York, N. J.
F. Lewis Torrance, 503 College St., Winfield, Kan.

A GROUP OF DIFFRACTION RINGS
1st ($15.00) Prize Winning Letter

Submitted by Milton Kaletsky, 2301 Morris Ave., New York, N. Y.

The cover of the September, 1932, issue of WONDER STORIES represents part of a group of diffraction rings.

Such diffraction rings may be produced by three different methods.

1. A beam of light, passed through a minute aperture such as a very small pinhole in a metal plate, and allowed to fall upon an opaque surface will produce diffraction rings.

Electrons are now believed to possess the properties of electromagnetic waves in some cases. This leads to the two remaining methods of obtaining diffraction rings.

2. A stream of electrons, when caused to penetrate through a minute area of a thin metal film such as gold leaf, and then allowed to fall upon an opaque surface, will generate well-defined diffraction rings.

3. A similar stream of electrons, if reflected from a minute area of a thin metal film and then caused to fall upon an opaque surface, will also yield a group of diffraction rings.

ALSO DIFFRACTION RINGS
2nd ($7.50) Prize Winning Letter

Submitted by Maurice J. Baruch, 881 Fox Street, New York, N. Y.

The cover of the September, 1932 issue represents a series of diffraction rings. Diffraction is the bending of light into the geometrical shadow of an object.

This phenomenon is caused by the interference of electromagnetic waves as they pass through minute apertures in thin opaque bodies. The main practical use of this phenomenon is in the diffraction spectroscope.

All diffraction rings, whatever their origin, are alike. Starting with the central spot, they spread away in concentric circles which are alternately dark and light. Also, as the rings recede from the center they become broader. It will be noticed that the rings on the cover, beginning with the one in the lower right corner, are also alternately dark and light. The rings also grow broader as the upper left corner is approached.

Such diffraction rings may be produced in three ways:

1. A beam of light passing through a minute opening in a thin opaque body and falling onto a surface will give rise to these rings.

2. Since recent investigations have proven that electrons are capable of acting as waves, a similar series of rings will be produced if a stream of electrons is substituted for the beam of light mentioned in the first method.

3. A similar stream of electrons, caused to penetrate a small particle of gold leaf and then allowed to fall on a surface, will also produce diffraction rings.

Maurice J. Baruch.

SCINTILLATING OIL
3rd ($5.00) Prize Winning Letter

Submitted by Mrs. Geo. H. Wyman, 236½ N. New Hampshire, Los Angeles, Calif.

I believe Artist Paul has used the same thin film of oil the second prize winner of the first contest accredited him, this time, however, treating it in a different manner. The oil, I believe, he (hypothetically) spread upon a surface of calm water. Any small object was then dropped upon the scintillating oil. He (again hypothetically) magnified the riplets of color and drew the cover after the effect produced.

The Earth and Its Visitors

● MANY writers have discussed the possibility and probability of the collision of other bodies with the Earth. In the article "Meteor Crater Mystery Solved" a geologist explains the ingenious method of locating the great Arizona meteorite, the existence of which had long been discussed. This mass of iron—or rather masses—would have destroyed any city on which it fell; a larger one—comparable in size to one of the larger asteroids—might destroy a continent.

"How do we know how old the Earth is?" When scientists say that the Glacial Period was fifty thousand years ago, have they any real reason or are they just guessing? Some of the means by which dates are carried back before the dawn of human history, less than six thousand years ago, are explained in "Nature's Diaries."

Both these, and many other scientific articles, are contained in the big December issue of

EVERYDAY SCIENCE AND MECHANICS

The Planetoid of Doom

(Concluded from Page 583)

produced records of sea snakes as large as any that attacked us, ribbon fish larger than those we encountered, and against our estimate of forty-foot tentacles for the octopus, they produce a record of portions of a dead one washed ashore with tentacles that must have originally been at least sixty feet long.

Nevertheless, those of us who actually encountered the monsters in New Orleans believe they were abnormal.

It seems incredible that the planetoid, so insignificant in size when compared with the earth, should have caused the death of millions of people and submerged a considerable part of the North American continent. It really produced both of these effects indirectly. The tidal wave was so enormously destructive because the inhabitants of the southern United States were living practically at sea level. Any convulsion severe enough to produce a great tidal wave might easily have been equally destructive.

The increase in tension of the crust of the earth and the great earthquake, followed by the subsidence of the Mississippi valley, restored a condition which probably existed in the prehistoric past. The inland sea covering the Mississippi valley possesses many advantages over the turbulent uncontrollable river. A large part of the land which disappeared consisted of malarial swamps which were probably irreclaimable.

The world is going on as if the catastrophe had never occurred. Sometimes Jim and I almost doubt it ourselves. Then we go to the New York Museum of Natural History or to the Smithsonian at Washington and gaze at the stuffed tyrannosaurs we saw killed on the New Orleans docks.

THE END

Space Rays

(Concluded from Page 593)

tion of 4.5 normal for I don't know how long. I'm hurt, the ——— ——— ——— used a screwdriver on me. Threw it like a bullet from a gun.

"Now: batttle stations. Tie that thing up till I'm ready for it. It escaped? Broke its bonds? Then tie it! Put one and a half reverse accelerations, but turn the ship around. First, put that damned radio on the blink, he's got it going, sending a direction-howl. Then make sure the lights are off, and use only the colored lights inside. Check the electrometer.

There was a shrill clangor as the electro-detector caught the tell-tale emanations of powerful atomic generators driven hard. "Ship over-taking us, Captain! Comin' like a streak of light. Funny looking patchwork thing. Must be a thousand years old. I'll bet they plan to ram us, they're comin' too fast to stop," reported the pilot.

"Ray—paralyzer," snapped Jennings.

The generators in the bowels of the ship hummed a deeper note.

"Oh, GOD! Cap—they've *got a screen! The rays don't touch them!*" called the pilot.

Barclay's face lit with a smile, Jenning's eyes opened in consternation.

"Put all your power in induction, switch suddenly to paralyzer," ordered Jennings.

The ray operator's fingers flew. A moment later his face fell. "Didn't touch 'em," he reported.

"Why aren't they raying us?" demanded Jennings in a puzzled tone. "Oh—the prisoners." A smile of satisfaction came over his face. "Listen, throw every kilowatt, even the shield-base power, since they won't ray us, and turn it into the Miller Twin rays, our kind friend installed for us."

Jennings grinned at Barclay as he wrapped a bandage around his injured wrist. The ray operator was working again, and the shrill whine of the generators fell to a rumbling hum. The Twenty-five Hundred hung motionless beside them now, manned by Jovians it had been able to stop.

A green bulb flashed suddenly on the pilot-board. The Twins were ready.

● Two milky tubes of radiance leaped out into space, curved sharply, and cut suddenly across the Twenty-five Hundred. Something was wrong, the Twin Beams, touching adjacent patches on the ship's side, did not flash into arcing, burning light.

"The paralyzer screen," said Barclay's calm voice in the tense silence, "I helped develop it. You left records when your fiasco demonstration was made."

"Guns," he went on, but his voice was suddenly drowned out. The two patches which the beams touched suddenly flashed with terrific fire. Somewhere below, in the depths of the ship, the great generators rose to a singing whine as the milky beams glowed with blue fires, terrific shattering lightnings at 100,000,000 volts pressure and 15,000,000 horsepower.

They whined like titanic disc saws, then, incredibly they struck some cosmic snag, the shrill whine became an awful, soul-wrenching, nerve-shattering grind, the ship trembled throughout her length, and with an awful abruptness but there was no sound. A man speaking in the engine room suddenly was shouting in silence. The awful calm lasted a fraction of a second. Then it exploded into eye-searing light and terrific concussion. The generators had been re-polarized and exploded, taking a wall with them.

It was quiet again, the faint chug of air-pumps gone.

"Guns," resumed Barclay calmly, "kick—and Miller beams work both ways. I hoped you'd install those beams for me. It was the only way we could destroy your defensive generators without destroying you—to throw them against the hundred million horsepower Ridgely Atomic on that ship."

Jennings stared at him in stupid amazement.

Somewhere behind came the bump and clang as the Twenty-Five Hundred came alongside the helpless ship.

THE END

Science Questions and Answers

This department is conducted for the benefit of readers who have pertinent queries on modern scientific facts. As space is limited we cannot undertake to answer more than three questions for each letter. The flood of correspondence received makes it impractical also, to print answers as soon as we receive questions. However, questions of general interest will receive careful attention.

Dimensions in the Universe

Editor Science Questions and Answers:

Somewhere I saw a list of the dimensions of various groups of material bodies in the universe, which attempted to show the place of each group. I wonder if you could reproduce that list. It gave the dimensions of electrons, atoms, planets, solar systems etc.

Fred H. Berberry.
Oakland, Cal.

(The following list, from "Flights from Chaos" by Harlow Shapley, may be what our correspondent refers to. We might say that Dr. Arthur Compton had prepared a corresponding list, in which he showed that man, as far as his physical dimensions were concerned, stood about in a mid-point of the scheme of things.

Diameters of material systems, in centimeters

Proton	10^{-13}
Atom	10^{-9}
Molecule	10^{-7}
Colloid	10^{-6}
Man	$10^{2.25}$
Comet and Meteor Stream	10^{7}
Earth-Moon system	10^{11}
Solar system	10^{15}
Galactic cluster	10^{19}
Globular cluster	10^{20}
Star cloud and galaxy	10^{22}
The galactic system	10^{23}
The Metagalaxy	10^{27}
The Universe (radius)	10^{28} (?)

The "metagalaxy" is a supergalaxy, of which galaxies are parts. It will be noted that the size of the universe given is estimated at 100 times that of the metagalaxy. Shapley says, also that, "the estimate of the diameter of the hypothetical 'closed universe' is based on very provisional data interpreted with the general theory of relativity. The diameter of the metagalactic system is merely an indication of the distances of the remotest galaxies now photographed with the large telescope. Although accuracy cannot be claimed for the estimates of diameter, they are certainly of the right order of magnitude."

In the above list the size of a man would be approximately 185 cm or $10^{2.25}$.

In order to explain the above figures: 10^{-13} means $1/10^{13}$ or 1/10,000,000,000,000 or 0.0000000000001

10^{-6} means $1/10^{6}$ or .000001

10^{7} means 10,000,000

10^{28} means 100,000,000,000,000,000,000,000,000,000 or

The place of man in the cosmic scheme may be understood from this list.—*Editor)*

Our Moving Sun

Editor Science Questions and Answers:

We know that the earth is hurtling through space in its orbit, at about 18 miles per second. What I wish to know is if the sun is a stationary body or if it moves, and if so does it follow a certain orbit or is it a freely moving body in space?

Clyde Cockran,
Chicago, Ill.

(So far as we know there is no body in space that is absolutely stationary, assuming that an absolute point of reference can be found to determine whether it is in motion or not. Certainly a stationary body would presuppose one that was at the exact center of gravity of the entire universe, or was under such a balance of forces from all other bodies in the universe that it did not move. A stationary body is under general principles, an anomaly. Our earth as part of the solar system, revolves about the sun to keep itself out of the sun's gravitational grasp. Our sun is one of the millions of suns in the galactic system known as the "Milky Way." Now just as the sun, so the galactic suns are attracted to each other. Evidence seems to indicate that the whole galaxy of stars which is the Milky Way is rotating about its center of gravity. And since the sun lies quite a distance from this center of gravity it must also be rotating about it.

Continued observation over many years shows that our sun is moving through space toward the star Vega and at a speed of some 12 miles per second, carrying the solar system with it. We are not certain that this is an absolute motion, for it has been determined only by isolating the velocities of a number of stars with reference to the sun.

Now since the sun lies about 47,000 light years from the center of the Milky Way, it is quite possible that the sun is pursuing an orbit about this center, its orbit being some 200,000 light years in extent. Even assuming that the sun has a velocity of 1,000 miles a second with relation to this center then it would take it some 56,000,000 years to complete one revolution. If we compare this with the 2,000 odd years that we have had astronomical observations of any value, we can see that in that period the sun will have completed only an infinitesimal portion of its orbit, and any attempt to plot or determine that orbit is quite useless. There is no doubt, however, that the sun is not a freely moving body in space; it is subject completely to the control of the motion of the galactic system.—*Editor)*

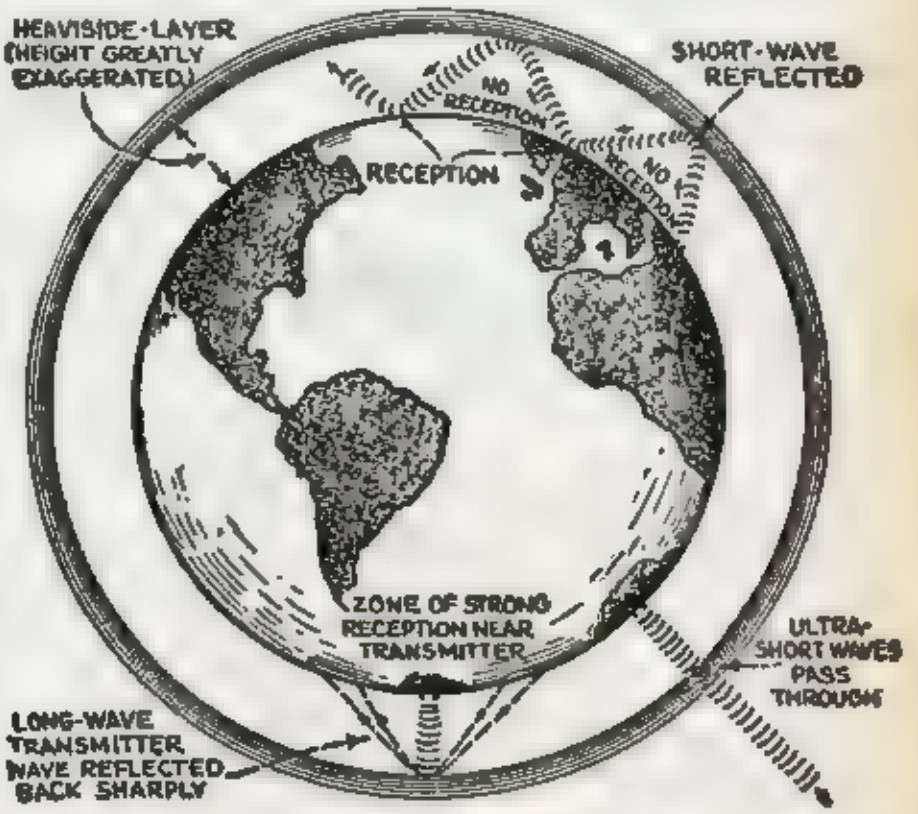
Skip Distances—The Heaviside Layer

Editor Science Questions and Answers.

Some time ago, in response to an inquiry you printed some data regarding the phenomena of skip distances in radio, and the effect of the Heaviside Layer upon radio reception. Could you explain these things and illustrate by a diagram?

W. L. Penrod,
Baltimore, Md.

(In the accompanying diagram is shown the various course that radio waves take after leaving the transmitter. In general three types of waves can be considered: the short waves, whose wavelengths vary from 5 to 200 meters; the "broadcast" waves which vary from 200 to 600 meters and the long waves which vary from about 600 to 20,000 meters. There are also experimental waves called "ultra-short" waves whose length is smaller than 5 meters. These however are not used in general broadcasting.



Showing the Heaviside Layer girdling the earth and the path travelled by various radio waves. The phenomena known as "skip distances" may here be noted.

The diagram indicates the fate of these various waves when they strike the Heaviside Layer. The ultra-short waves being the most penetrating actually are not stopped by the layer but go on out into interplanetary space to be caught, perhaps by some of our planetary neighbors.

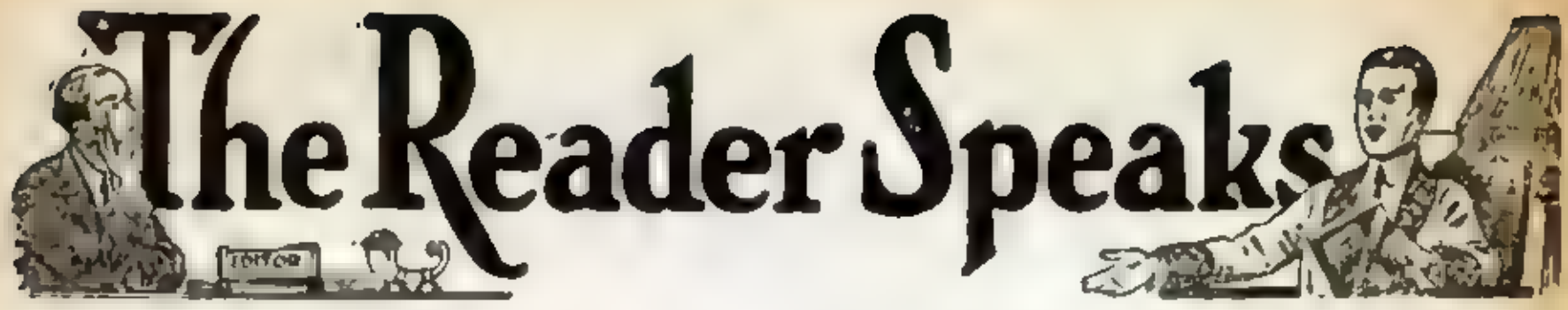
The short waves striking the Heaviside Layer, are reflected back to earth, which in turn reflects them back to the Layer, and so on, as indicated, all around the earth. The distance between two points at which the waves strike the earth in their course about it is called the "skip distance." Only at these points where the wave strikes the earth is radio reception of these waves possible. Between these points of contact, as shown in the sketch, are areas of no reception.

When the longer waves strike the Heaviside Layer they are reflected back quite sharply and dispersed somewhat over the earth. The effect, one might say, is that of the waves being "spattered" as a result of striking the Layer. Near the transmitter therefore would be an area of reception.

This account does not of course attempt to cover other manifold phenomena of radio waves, but deals only with the effect of the Heaviside Layer upon them.—*Editor)*

READERS

If you like "Science Questions and Answers" in this magazine, you will find in our sister magazine, EVERYDAY SCIENCE AND MECHANICS, a similar department, greatly expanded called "The Oracle." Look for it, you science fans!



IN THIS department we shall publish every month your opinions. After all, this is your magazine and it is edited for you. If we fall down on the choice of our stories, or if the editorial board slips up occasionally, it is up to you to voice your opinion. It makes no difference whether your letter is complimentary, critical, or whether it contains a good old-fashioned brick bat. All are equally welcome. All of your letters, as much as space will allow, will be published here for the benefit of all. Due to the large influx of mail, no communications to this department are answered individually unless 25c in stamps to cover time and postage is remitted.

A History of Science Fiction

Editor, WONDER STORIES:

It may be rather a late date to take up the gauntlet that Mr. Smith has so righteously—and rightly—thrown back at me. I suppose I deserve what I got. I had it coming. But I want to try to beg off.

Fundamentally, there is no quarrel between us. I have no desire to witness the rise of a Theodore Dreiser or an Aldous Huxley of science fiction. I remember, when I was several years younger, starting to read something of Huxley's that was being lauded by the critics. I didn't finish it, and I haven't noticed it on the library shelves for some time. Maybe it was worn out. Maybe it was thrown out. I imagine that "Brave New World" has a little too much of the same in it to be much of an ornament to science fiction. Still, I haven't read it, so I can't say.

It seems to me that there can be said to be at least three stages in the development of literature, and, what amounts to the same thing, in the development of Man's taste in literature. I will limit myself to fiction for illustration, which is what is concerning us here.

What were the first stories told beside the fires of the first speaking men? Were they not fantasies—lurid imaginings about the demons and gods of the forest and the mountains, and the lords of the skies—scant and faulty observations retailed at second-and third-hand and spun together in an imaginative web? What are the first things that children read—fairy stories, fantasies, dream-spinnings that fit vague experience into imagination? What were the Victorian romances but just this?

Next come hunters' tales: tales of heroes fighting man and beast in the nakedly terrible world that every cave-child knew only too well: realism. Maybe the women told tales too, of raiding Neanderthalers of raw life among their own raw people. Children, as they grow older like what is or passes for realism—Alger, Buffalo Bill, Nick Carter, the Merriwells or, nowadays, Heyliger, stories of school and sport and industry. The girls like stories of boarding schools or camps, with enough mystery to keep them from becoming bored. While in one sense they are realistic, in another these stories are still in the first realm of fantasy or on its border. Realism in modern adult literature needs no comment.

Third, I think comes a second fantasy—adult fantasy. In children it may possibly correspond to the shift from the school and work stories of high school years to the beginnings of adult fiction, western stories, love stories, action stories. Adults who are mentally children never get past this stage. Modern realism has been lauded mainly by the "highbrows." In history or prehistory I believe it corresponds to the first consciously invented tales, with some cue in experience, as all tales have. These became the roots of the first fantasy of world-literature. Returning to our third field, that of adult literature, we find Lord Dunsany and maybe a handful of others whose names are scarcely ever mentioned. They are ahead of their time. But the world is creeping up to them.

Science fiction is our concern. The same three stages are evident. Most of what has been written—much of it marvelously done, by master story-tellers—has been first stage fantasy, sheer, unbridled wondering about things that were a mystery to most people and probably to the writer. Imagination being limited, we had human beings on other planets or in other dimensions, ruling by the supreme egotism of the human animal over all sorts of weird things. Then someone—maybe it was Mr. Gernsback—discovered that these were more than the "fantasy" or "different stories" that the Munseys used to call them. There was science in them. There should be science in them. Science, in the popular mind, had been emphasizing astronomy and evolution until Man had begun to seem pretty insignificant. See Austin Hall's "Man Who Saved the World." Science meant putting Man in his place. There was a rush of non-human intelligences that is just dying out. The outstanding example is Merritt's "Shining One" in "The Moon Pool."

Realism is just coming in. The Germans seem to have started it, if we are to judge from the columns of Wonder Stories. The rest of us are following suit, more or less, if we can. And since realism in the rest of literature is still enthroned, though toppling, if science fiction is realistic at the same time it stands a good chance of being recognized as part of literature and as worth taking into account. That is the feeling behind what I said before. By writing about science as it is, previously scorned writers are going to go places. It may not count for much artistically, but, as has been often said before, artists have a fondness for eating and living and seeking artistic inspiration in less realistic places than those unduly familiar.

Mr. Smith doesn't agree with this because most of what Mr. Smith writes is ahead of the times, in the next stage, along with Dunsany. His stories are what I might call adult fairy-stories. It takes an adult imagination to get out of them what he has put in. For the morons they are back on the first level—vaporings—and interesting because vivid. The few who can't see anything but the rising realism howl about them. The rest of the world enthuses.

In the interests of completeness I want to have a whack at making out a series of authors ranging from one end of this scale to the other. Of course, all three types exist more or less at the same time, largely, perhaps, because all people weren't born at once, or with the same minds. The list won't be at all chronological. I don't know enough of the history of science fiction yet for that. But here goes:

(1) First fantasy—Cummings. (2) First transition—Starzl. (3) Realism—Dr. Keller. (4) Second transition—E. E. Smith. (5) Second fantasy—C. A. Smith. These are not supposed to be the masters of each stage. They are the ones that have come to my mind. Many are not placed. Merritt seems to skitter all the way from one end of the scale to the other, depending on how you feel when you read him. That is probably why most people, except the most blue-nosed of realists, take to him like ducks to water. John Taine is hard to place, but he roosts pretty close to class (4). And Mr. Smith doesn't always stay by himself way up in (5). No one could. Even Dunsany comes out of it to write poetry and even tales and plays.

Perhaps you know what the normal probability curve looks like—a steep, rounded hill, symmetrical on both sides. It will be steep in this case because there are a lot of authors competing. If we spread out our class-numbers along a line and base the curve on them, I should say that its peak is between (2) and (3), moving toward (3), with (5) just barely rising above the dead level of oblivion.

This is a crude way of putting it—the whole thing is—and not at all scientific or literary, but it shows roughly what I was driving at before. Mr. Smith, perched up by himself in berth (5), can't see anything in the rest of the world's "literature" to make him want to be considered in on it. The rest of us, experimenting a little, tearing madly from one end of the scale to the other in an attempt to find a place where we can rub elbows, are having a lot of competition and would be only too glad to be considered part of a bigger world, where, if we are successful, we may reap the fruits of greatness.

I don't mean that all science fiction should emulate Hemingway. I do mean that we're done with day-dreams; and are headed toward bigger problems, human problems, and toward Mr. Smith in the far beyond. Whether he'll be there when we reach there is another question. If my probability-curve simile is any good at all, there should be a beyond that I haven't touched. Let's hope so. And I repeat—we see what we're looking for.

P. Schuyler Miller,
Scotia, New York.

(This is such an excellent letter, that we won't add any footnote to it. We disagree with Mr. Miller in places, but we will leave criticism if any to our readers and to Mr. Smith.—Editor.)

ON LETTERS

BECAUSE of the large number of letters we receive, we find it physically impossible to print them all in full. May we request our correspondents, therefore, to make their letters as brief and to the point as they can; as this will aid in their selection for publication? Whenever possible, we will print the letter in full; but in some cases, when lack of space prohibits publishing the complete letter, we will give a resume of it in a single paragraph.

On Contests

Editor WONDER STORIES

The September issue of Wonder Stories was simply great! It by far surpassed all of your former issues and you will have to go to great length to better or even equal it in the future.

"The Death Of Iron" by S. S. Held took first place with little or no effort at all. Second place was taken by the unsurpassable masterpiece of Francis Flagg "After Armageddon," in which he outdid himself a thousandfold. Third place was won by P. Schuyler Miller with his wonderful story "Red Flame Of Venus." Mr. Miller can spin a yarn with the best of 'em.

A word about the prize contests. If you are going to have cover contests, why not have incomparable Paul paint an illustration depicting a scene filled with action, suspense, and science and thereby open a contest for stories based on or built around the illustration. About two or two and one-half years ago you sponsored such a contest and from what I have heard there is nothing unfavorable to the contrary, so how about renewing this policy, Ye Editor, and thereby saving me much grief and anguish?

Fred John Walser,
Denver, Colo.

(Continued on page 607)

ANATOMICAL MANUAL

THE HUMAN BODY

ONLY

$2.00

postpaid

A UNIQUE NEW MANUAL OF SECTIONAL ANATOMICAL CHARTS AND ILLUSTRATIONS PREPARED BY MEDICAL EXPERTS.

All plates (one foot high) are printed in actual natural colors

This new book shows the human body with each aspect of its structure in separate sections; the exact position of all organs, every bone, muscle, vein, artery, etc.

LIST OF PLATES

Plate I. Nude Adult Female

Plate II. Nude Adult Male

Plate III. Nervous Systems of Female

Plate IV. Skeletal System

Plate V. Muscular System (Posterior)

Plate VI. Muscular System (Anterior)

Plate VII. Vascular System

Plate VIII. Respiratory System

Plate IX. Digestive System

Plate X. Male Genital Organ in Detail

Plate XI. Female Genital Organ in Detail

Plate XII. Cross-Section of Pregnant Female Body with Child

Thus far, plates such as those presented here have been so high in price as to be inaccessible to the general public. Our plan in producing these charts is to make them available to every adult person.

The book is 14 inches high and 9½ inches wide. It contains twelve full-page color plates and twelve text pages illustrated with fifty photographs and drawings, made from actual photographs, and all organs and parts of the human body—male and female—are shown in great detail in natural colors.

Opposite each page, an explanatory text is provided, and this is in turn illustrated with photographs and drawings to show in detail the different organs and other features of the human body. The book is especially recommended for the use of nurses, art students, to lawyers for use in litigations, lecturers, physical culturists, hospitals, sanitariums, schools, colleges, gymnasiums, life insurance companies, employer's health departments, etc.

But every man and woman should own a copy of the ANATOMICAL MANUAL for effective knowledge of his or her own physical self!

Money Refunded If Not Satisfactory

MAIL COUPON TODAY!

NORLEY BOOK CO., Dept. WS-12,
245 Greenwich Street, New York, N. Y.

Gentlemen:—Enclosed find $2.00 in full payment for a copy of the ANATOMICAL MANUAL, as per your offer.

Name _____

Address _____

City _____

State _____

THE READER SPEAKS

(For the sake of variety we are giving our readers all kinds of contests on which to exercise their minds and imaginations. The July and September contests were the idea of the Editor. They provoked considerable enthusiasm, and the results were very gratifying. One of these days we will try a new one.—*Editor*)

Truth Ever Stranger

WONDER STORIES are indeed interesting. I have often wondered though why the authors have to resort to trips to other planets and journeys to other times and dimensions. This does violence to one's reason. Truth is ever stranger than fiction. The only trouble is that unless one travels to some strange planet or time the difficulties are too great to cope with.

We all know that there exist today everywhere people who live in past ages. Do not think, dear reader, because you see 1932 on the calendar, that all the people you see live in that year? There are many who have not evolved out of the dark ages. How else can you explain their actions?

Then there are some who live ahead of time. We all know pretty well who they are. Readers of WONDER STORIES are without doubt living in this present century. It interested me to read the story entitled "In the year 3000" in the July number. One does not need, however, to wait until that year to know about Esperanto, the international language, as the author suggests. There are today many hundred thousands who use that tongue. I know some very fluent speakers myself. We never have the slightest difficulty in understanding each other. It is strange how such a tongue influences one's ideas.

F. Stancliff,
Akron, Ohio.

Predictions Come True

In completing the October issue of WONDER STORIES I cannot help but writing to compliment you upon it for its variety. The fans who have been complaining about having all interplanetary stories should certainly be satisfied now.

The other day I reread some of the old AMZ and SCIENCE Wonder stories I have and I couldn't help noticing the number of predictions made by some of the authors that have come true. I also could not help noticing the vast improvement in your stories in spite of the similarity of plot in most of them. Keep up the good work, Mr. Gernsback.

How about some more serials by Otfried Von Hanstein? I don't think that "Electropolis" has ever been equalled. What has happened to Campbell and Keller? I'm sure that everyone would welcome their stories anytime.

I guess I started this letter backwards as I always start reading the "Reader Speaks" columns first. I certainly agree with Arther Jaffey of Chicago regarding element 85. There is no doubt that 85 is a solid and not a gas. It might be radioactive but never a gas. There is no better defined family in chemistry than the halogens in the Periodic scheme. In your note you state that further researches will probably have to be performed before the physical state of the element can absolutely be determined, but if 85 is not a black solid with a greater density than iodine then the whole chemical system is wrong.

Kenneth Hitch,
Point Richmond, California.

Leave Politics Alone

Many thanks for publishing my story "The Message from Mars." I should have written to thank you before, but I have managed to overwork myself and had to go away on a long vacation.

I am right again now, after a good rest at the seaside, and have enjoyed immensely the brickbats from your readers. Such frank opinions, so vigorously put, are a wonderful preventive from getting a swollen head!

I believe I got one bouquet, though . . .

Well, *sic transit gloria mundi!* I am afraid your readers do not like my style of writing. This story of mine has been written as far back as 1924, when we were still fresh from the wars, and at the time proved to be acceptable to the British public.

My handicap is complete ignorance of the American public. I think that I shall in future leave politics alone.

You "Wind" This Pen

YOU turn the knurled end of the barrel to fill or empty the new Conklin Nozac (no sack). There is no rubber sack in this new pen. The ink capacity is 35% greater than sack pens. Here is the greatest student's pen ever made.

And there is a transparent section in the barrel through which you can see at all times how much ink is in the pen and be reminded to refill it. Made in beautiful new colors at $5.00 and more. Pencils to match $3.50 and more. Another outstanding pen is the Conklin Endura at $5.00 and more—the peer of the best of all pens employing the familiar rubber sack ink reservoir.

Left to right—The Conklin Endura, $5.00. The new $5.00 Conklin. A genuine Conklin at $3.75.

THE CONKLIN PEN COMPANY
Toledo Chicago San Francisco

Conklin
NOZAC
SATISFACTION GUARANTEED

NEW MORALS *for* OLD

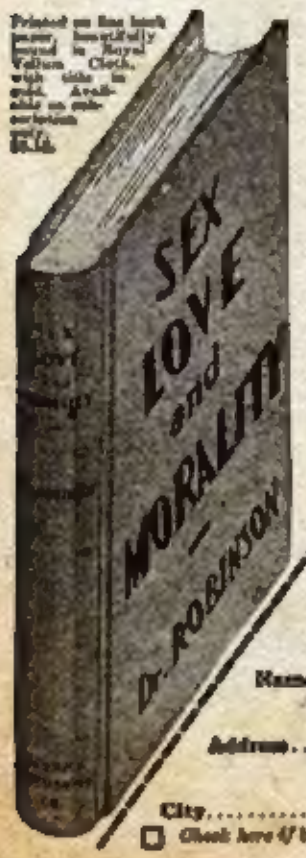
Now comes a daring new book about sex, different from any other you may have ever read before. It is a book written especially for men and women who are not afraid to face the facts, and who want to learn the real truth about sex and sexual intimacies.

This startling new book, by Dr. William J. Robinson, discusses in the plainest language everything pertaining to the sex life, both in marriage and out of it. Is it wise to think of morals only as it concerns sex? Is it right to think of love as being possible only in marriage? These vital questions, and many more are discussed openly and frankly in this great book. It gives you an amazing new view of the whole question of sex, as seen by a famous Sexologist whose works are praised the world over.

This Partial Table of Contents gives you a faint idea of the value and the completeness of Dr. Wm. J. Robinson's wonderful new book, entitled:

SEX, LOVE *and* MORALITY

Principles of General and Sexual Morality
Promiscuous Relations
Extra-Marital Relations, with 10 Illustrations
When Love Complicates the Problem
Frankness Between Husband and Wife
The Domestic Trio
Love and Sexual Intercourse
Wrong View of Sanctions and Duties of Love
Sexual Favors
The Double Standard
Unnatural Methods of Love
Definition of Prostitution
Prostitute's Moral Level
Prostitute's Mental Level
Ethics of Prostitution
Does Prostitution Supply a Genuine Need?
Will Prostitution Ever Disappear Entirely?
What to Do With the Prostitute
Three Kinds of Prostitutes
Homosexuality, Transvestitism, and Sadism
Rape
Incest
Masturbation
Abortion
Preconception or Birth Control
Divorce
Alimony
Breach of Promise
Illegitimacy
Miscegenation
Sex—What to Do About It.



Printed on fine book paper, beautifully bound in Royal Vellum Cloth, with title in gold. Available on subscription only. $5.15

Limited Edition, Write Today

Because of its unusual frankness, this great book may be obtained *only by subscription*. The number of copies on hand is strictly limited, and once they are gone you may never have another opportunity to obtain "Sex, Love and Morality." Take no risks. Make certain that YOU will own a copy of this vitally important work. Mail your order at once. Fill in the coupon now, before you turn this page.

Dept. SM 11
Nuvico Book Co.
24 WS Park Place,
New York, N.Y.

Enclosed is my remittance for $5.15, for which please send me prepaid in plain wrapper, a copy of the Limited Edition of "Sex, Love and Morality" by Dr. William J. Robinson.

Name.....

Address.....

City.....State.....

☐ *Check here if book is to be sent C. O. D.*

THE READER SPEAKS

(Continued from page 607)

I have written no fiction lately. My latest effort is a book on the Mathematics of Wireless.

Well, I trust that your are not getting too many abusive letters from your readers for having published my story.

Ralph Judson (Ralph Stranger),
Bexley Heath, Kent.

The Same as Earthians

The November issue was a grand and glorious one. Needless to say Clark Ashton Smith had the best story in it. The change of form of pages was a great improvement on the old straight back form. But as usual I must throw a few brickbats.

Your authors and artists have very little imagination. Very few authors when they write stories make the people on other planets take a different form from earth creatures. It seems that they are stuck fast to the idea that all living creatures have eyes, nose and mouth in human order. Many times they enlarge either of the features so that the creature is strange and un-earthly. But it always seems that the people of other planets resemble slightly those of earth. I don't see how in the world evolution can be the same on two planets. It's a mystery to me why authors insist on making Venusians and Martians the same as Earthians.

Walter Kubilis, Jr.,
Brooklyn, N. Y.

Book Reviews

DISTANT WORLDS by Friedrich Mader. 345 pages, stiff cloth covers, illustrated. Size 5½x8¼. Published by Charles Scribner's Sons, New York. Price $2.00.

This story of interplanetary exploration has been translated from the German, where it went through eleven editions. It properly belongs in the class of semi-scientific fantasy of Jules Verne and H. G. Wells, rather than the more soberly scientific of latterday interplanetary stories, such as those of Otto Willi Gail.

It concerns a group of men who take advantage of a gravity nullifying apparatus of a "Lord Flitmore," and embark on a journey to the moon. They go eventually to Mars where they have terrible experiences; to Saturn where they meet extraordinary adventures and have encounters with strange men and beasts until they become a daily occurrence. Finally, they reach a strange world where the inhabitants are of a higher order than mankind.

Although the story starts slowly, and with an improbable air, it gathers speed and movement as it goes on and we become acquainted with the characters. The book is light reading, and in addition to the adventures there are spots of broad German humor, provided occasionally by two chimpansees, Dick and Bobs, who are active members of the exploring party.

THE MOON POOL by A. Merritt, 430 pages, stiff cloth covers. Size 5¼x7¾. Published by Liveright, Inc., New York. Price $2.00.

The long awaited book publication of "The Moon Pool" has appeared. To those who have known the story only as one mentioned in our columns it will come as a new experience and adventure; and to those who have read it years ago, it will come as a pleasant and refreshing memory.

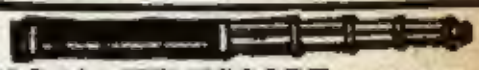
Mr. Merritt is here undeniably at his best, as he weaves his threads of mystery about the little Pacific island where strange forces and powers dwell. The story, as our readers know concerns a long lost civilization in the south Pacific, whose members have achieved an uncanny control of physical sciences, so what they have evolved might be called a "living light." Light performs wonderful feats, it draws into itself a group of innocent explorers who pass through amazing adventures before rescue finally comes.

The story is a long one, but Mr. Merritt achieves such a balance of tension and relief in his flow of incidents that the reader never wearies. The book still remains, as it once was, one of the epics of science fiction.

$5,000 WILL BE PAID TO ANYONE WHO PROVES THAT THIS is not the actual photo of myself showing my superb physique and how the Rose System has increased my own height to 6ft. 3½ inches. Hundreds of Testimonials. Clients up to 45 years old gain 1 to 6 in. in few weeks. No appliances. No drugs. No dieting. Rose System Never Fails. Fee Ten Dollars Complete. Convincing Testimony and particulars 4 cent Stamp. Allow time for return mails across the Atlantic.
C. MALCOLM ROSE, Height Specialist
Scarborough, England P. O. Box 118

First in 1927 First Today

Book Lovers
Ex-Libris Book Plates
LATEST series of OLD MASTERS book-plates, reproducing antique woodcuts and engravings. Unique creations for book-lovers who appreciate the unusual. Write for illustrated catalogue and specimen, enclose 10 cents for mailing charges.
WRITE FOR CATALOGUE
ISKOR PRESS, INC., 15 Park Place, Dept. A-1237, New York, N. Y.



BIG 3ft. TELESCOPE 5 sections. Brass bound 10-mile Range. Study Moon, Stars and distant objects with this powerful 4-x instrument. Special Eye-piece for viewing Sun included FREE. Makes an ideal Microscope. Guaranteed. Big value. Postpaid $1.75. C.O.D. 15c extra.
BENNER & COMPANY, T-76, TRENTON, N. J.

Kodak Enlargements
SEND YOUR BEST NEGATIVE
4 Prints 5x7 inch and 1 size 7x10 inch—$1.00. Beautiful Rough Luster finish. Send negatives. SEND NO MONEY. Pay postman on delivery.
W. S. BRANNEMAN, Dept. C
1154 Congress Ave. Indianapolis, Indiana

SECRET SERVICE
We Want Men And Women Of Average School Education, gifted with common sense, to study Secret Service and Scientific Crime Detection. If in this class and interested, write Joseph A. Kavanagh, Former Agent U. S. Secret Service, Director, International Secret Service Institute, Dept. WS13-32, 66 Hudson St., Hoboken, N. J.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Wonder Stories, published monthly at Mount Morris, Ill., for October 1, 1932.
State of New York } ss.
County of New York }

Before me, a notary public in and for the State and county aforesaid, personally appeared Irving Manheimer, who, having been duly sworn according to law, deposes and says that he is the business manager of the Wonder Stories and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Stellar Publishing Co., 404 No. Wesley Ave., Mount Morris, Ill.; Editor, Hugo Gernsback, 98 Park Place, New York; Managing Editor, David Lasser, 98 Park Place, New York; Business Manager, Irving Manheimer, 98 Park Place, New York.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Stellar Publishing Co., 404 No. Wesley Ave., Mount Morris, Ill.; Hugo Gernsback, 98 Park Place, New York; Sidney Gernsback, 98 Park Place, New York; D. Manheimer, 98 Park Place, New York.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

I. S. MANHEIMER,
Signature of Business Manager.

Sworn to and subscribed before me this 8th day of September, 1932.
(SEAL)
JOSEPH KRAUS,
Notary Public.
(My commission expires Mar. 30, 1933.)

ATTENTION CHEMICAL EXPERIMENTERS!

CHEMICAL OUTFITS

THE MAGIC WAND. For wholesome, harmless fun with chemicals, this outfit is just the thing. The most mysterious, marvelous, mystifying tricks of chemical wizardry can be performed with it by any boy. Size of box, 13¾ x 10½ x 1¾ in. Price **$1.00**

(Parcel post charge, 15c)

Contains an assortment of simple chemicals, which, when combined according to the secrets of the direction book which the owner receives with his outfit, produce wonderful and startling results. The Magic Wand itself is a magical stick with which many of the tricks are performed.

BOY'S CHEMISTRY SET. Furnished complete with directions and Experiment Book of 207 experiments. Price **$2.00**

(Parcel post charge, 20c)

Contains test tubes, test-tube holder, test-tube brush, gas delivery tube, glass tubing, stirring-rod, measure, deflagrating spoon, red and blue litmus paper, sulphide test paper, blowpipe, pipette, rubber tubing, and 18 different chemicals.

"CHEMCRAFT" JUNIOR CHEMICAL SET. A practical chemical laboratory outfit, packed in a handsome, substantial wooden box, with hinged cover, in which chemicals and apparatus are safely kept always in good condition. Size, 17 by 11¼ x 2⅜ in. Price **$5.00**

(Parcel post charge, 50c)

Contains 60 chemicals and pieces of apparatus, with Manual of Instruction for 300 fascinating experiments and chemical tricks.

LABORATORY APPARATUS OUTFIT. A handsome wooden cabinet containing a total of 58 pieces of apparatus. Price **$12.50**

(Parcel post charge, $1.00)

Includes various sizes of bottles, beaker, blowpipe, bunsen burner, burette clamp crucible and cover, Erlenmayer and Florence flasks, mortar and pestle, rest stand and ring, test-tube rack, graduate, many other pieces. *No chemicals.*

LABORATORY CHEMICALS OUTFIT. Compact wooden cabinet, containing 42 chemicals, no apparatus. Price **$10.00**

(Express charges, collect)

This outfit contains all of the chemicals required for experiments given in the average laboratory manual, and for all usual experiments in inorganic chemistry. All chemicals C. P. (chemically pure), all acids in big glass-stoppered bottles, dry chemicals in large-mouth glass bottles or turned-wood boxes, each labeled with full name and correct chemical symbol.

"CHEMCRAFT" AMATEUR CHEMICAL SET. A complete chemical laboratory, in a wooden cabinet, with hinged cover and with a separate test-tube rack, and Experiment Book. Size of cabinet, 20½ x 12 x 2½ in. Price **$10.00**

(Parcel post charge, $1.00)

This set contains 98 different chemicals and pieces of apparatus, including many rare and costly chemicals permitting of special and unusual chemical scientific experiments, and providing all materials and apparatus necessary for over 500 experiments and chemical tricks explained in the instruction manual.

C. I. N. Y. STUDENT'S CHEMICAL EXPERIMENTAL LABORATORY OUTFIT. Handsome stained wood portable cabinet, size 22½ x 17½ x 3¾, can be hung on wall or set up on table. Price **$25.00**

(Express charges, collect)

Contains 38 pieces of apparatus, 42 items of chemicals. All acids in big glass-stoppered bottles, dry chemicals in large-mouth bottles or turned wood boxes. All chemicals C. P. (chemically pure). All apparatus, instruments, and glass appliances of standard technical laboratory size. This is not a toy kit, but a practical working laboratory supplying equipment identical with laboratories of professional and university chemists.

CHEMISTRY BOOKS

POPULAR CHEMISTRY EXPERIMENT BOOK. Cloth covers, size 10 by 8½, 80 pages. Price **$1.50**

(Add 15c postage)

This book is filled from cover to cover with interesting, practical experiments in household chemistry, food analysis, ink and paint-making, safe fireworks, glass-blowing, electroplating, electrotyping, chemical magic. These fascinating experiments furnish the basis for many splendid money-making ideas.

ELEMENTARY CHEMISTRY SELF-TAUGHT, by Roscoe and Brookes. Cloth covers, size 5 x 7½, 276 pages, 40 illustrations. Price **$1.50**

(Add 15c postage)

A non-technical instruction book, explaining in terms which any reader can readily understand and apply, the principles and fundamental laws of chemistry, describing the elements and their compounds, where they come from and how they are composed, their characteristics and reactions, their combinations, and their uses in science, commerce, and the arts.

CHEMISTRY SIMPLIFIED, by C. A. Koenig. Cloth covers, 430 pages, 108 illustrations. Price **$1.75**

(Add 15c postage)

A book that succeeds in imparting the essential facts about chemistry not by the usual dry textbook method, but by unfolding in simple terms a concrete, understandable picture of just what chemistry is, and the work it does.

THE AMATEUR CHEMIST, by A. Frederick Collins. Cloth covers, size 5 x 8¼, 210 pages, 77 illustrations. Price **$1.50**

(Add 15c postage)

An extremely simple but thoroughly practical chemistry book. A vast amount of practical information is given, also how to make and do things which will save time and money.

EXPERIMENTAL CHEMISTRY, by A. Frederick Collins. Cloth covers, size 5 by 7½, 276 pages, 108 illustrations. Price **$2.00**

(Add 15c postage)

The story of acids, metals, alkalis, and salts as we use them in our food, our clothes, our daily work. Explains the chemical reactions of sunlight, the principles of electro chemistry, fire effects, magic tricks, with directions for fascinating amateur experiments.

HOW TO UNDERSTAND CHEMISTRY, by A. Frederick Collins. Cloth covers, size 5 x 7½, 324 pages, 72 illustrations and tables. Price **$2.00**

(Add 15c postage)

An easily understandable discussion of the fundamentals of chemistry. Explains matter and its make-up; the common elements; the symbols of chemistry and how we use them; mixtures, compounds, chemical changes; formulas; the nature of acids, bases, salts; electrochemistry; thermochemistry; the making of the new synthetic products—showing modern applied chemistry at work in our everyday life.

HANDBOOK OF CHEMISTRY AND PHYSICS, by Hodgman-Lange (16th edition). Flexible covers, 1,546 pages. Price **$2.75**

(Add 15c postage)

A complete reference work in Mathematics, Chemistry, Physics, and all related sciences, used more often than any other single reference work in almost every commercial laboratory in the country. Indispensable to industrial, chemical, mechanical electrical, and radio engineers. Includes tables used in mathematics, chemistry; hygrometric and barometric charts and tables; tables of data on heat, sound, electricity, magnetism, light, radio, laboratory formulae, latest data of technique and application of scientific information.

CHEMICAL DICTIONARY, by Iago W. D. Hackh. Cloth covers, size 6½ x 9¾, 790 pages, 232 illustrations, over 100 tables. Price **$10.00**

(Add 35c postage)

This comprehensive, authoritative book contains detailed, practical definitions of over 33,000 terms used in every phase of chemistry, covering all the substances, processes, apparatus, and the whole range of theory and practice pertaining to this science, down to chemical symbols and technical designations and their approved spelling and pronunciation. Actually an encyclopedia of vital information on chemical subjects not usually obtainable, and a valuable reference manual for students, teachers, experimenters, and professional chemists.

THE SPIRIT OF CHEMISTRY, by A. Findlay. Cloth covers, 402 pages, illustrated. Price **$3.75**

(Add 15c postage)

A "different" type of book on chemistry. Not a text treatment, but an account which reads like a fascinating story, of the great discoveries and achievements in chemistry, how they came about and what they have contributed to human progress and our own lives today.

ELEMENTARY MATHEMATICS for the Technician and Craftsman by A. C. Shainmark. 6 x 9. Stiff colored cover, 64 pages, illustrated. Price **$0.50**

(Sent postpaid)

The manual has been written especially for the man who wishes to acquire a working knowledge of the elementary principles of mathematics. Special attention is devoted to showing how to apply the rules of mathematics in his profession or business. Very useful to the chemical Experimenter, and laboratory worker.

FORMULAS AND RECIPES, by H. Gernsback. 6 x 9, stiff colored cover, 64 pages, illustrated. Price **$0.50**

(Sent postpaid)

This book contains a collection of Formulas, Workshop and industrial Recipes, information on famous preparations, Trade Secrets, Chemical Processes, Working Directions, Scientific Data and Home Remedies. Every formula has been selected with a view to its usefulness to the experimenter and practical technical man.

MICROSCOPES

JUNIOR LABORATORY 20-POWER MICROSCOPE. This microscope magnifies 400 times surface area. Price ... **$2.00**

(Add 20c for packing and postage)

Stationary mirror. Over-all, height 5½ in. Metal stand, beautifully finished in black crystallized instrument lacquer. Lenses are ground and polished by hand, and mounted in nickle-plated seamless brass tubing.

AMATEUR LABORATORY 60-POWER MICROSCOPE. Same construction as JUNIOR LAB. 20-POWER MICROSCOPE (above), but magnifies 3,600 times surface area, and has adjustable mirror. Price **$3.00**

(Add 25c for packing and postage)

Over-all height 6 in. Metal stand, beautifully finished in black crystallized instrument lacquer. Lenses are ground and polished by hand, and mounted in nickel-plated seamless brass tubing.

PROFESSIONAL 116-POWER LABORATORY MICROSCOPE. The convenient size, simple manipulation, and precise optical qualities of this microscope will appeal to biologists, chemists, geologists, laboratory workers and experimenters. Price **$10.00**

(Add 40c for packing and postage)

Detachable base permits examining large and small objects. Single achromatic lenses, magnifying 50X, 75X, 100X, and 110X. Non-tilting stand. Height, extended, 8½ in. Chromium and black lacquer finish, complete with case.

MICROCRAFT OUTFIT. This very interesting outfit comes in a case 8½ x 6 x 2½ in., which contains: One JUNIOR LAB. 20-POWER MICROSCOPE, Tweezers, Dissecting Needle, Preserving Bottle, Fluid Dropper, Box of Cleaning Tissue, 16 Slides, 2 doz. Slide Covers, 14-page Instruction Book. Price **$3.00**

(Add 25c for packing and postage)

THE BOOK OF THE MICROSCOPE, by A. Frederick Collins. Cloth covers, size 5 x 7½, 245 pages, 71 illustrations. Price **$1.50**

(Add 10c for packing and postage)

Simple but vivid descriptions of all the fascinating uses of the microscope. Wonders of plant and animal life, curious hygiene facts, the microscope in criminal investigation, are but a few of the absorbing subjects discussed. Splendid for students, experimenters, etc.

FORMULA SERVICE

START A BUSINESS OF YOUR OWN WITH OUR RECIPES, FORMULAS, AND TRADE SECRETS

Here is a list of complete sets of Chemical Formulas and Recipes, of different practical kinds, with which you can manufacture articles for which there is a constant popular demand, and start your own business. Besides furnishing the formulas and recipes, we give you full directions for measuring, mixing, etc. Furthermore, we tell you how and where to buy your materials if you cannot procure them in your own locality. We tell you how to package and price your wares, and then we show you how to market them. In fact, every single step is explained to you so thoroughly that it is impossible for you to make a mistake.

FORMULA SET A. Contains 20 different formulas and recipes for manufacturing **cosmetics**, including **creams, lotions, shampoos, hair tonics, dental preparations, hygiene aids**, etc. Price, postpaid **$5.00**

FORMULA SET B. Contains 20 different formulas for **metal polishes, automobile polishes, solders, compositions**, and **alloys**. Price, **postpaid** **$5.00**

FORMULA SET C. Contains 20 different **cleaning, dyeing, spotting**, and **bleaching formulas**. Price, **postpaid** **$5.00**

FORMULA SET D. Contains 20 different formulas for **paints, enamels, thinners, lacquers**. Price, **postpaid** **$5.00**

FORMULA SET E. Contains 20 different formulas for special **glues, cements, mucilages**, etc. Price, **postpaid** **$5.00**

FORMULA SET F. Contains 15 different formulas for **disinfectants, water-softeners, household** and **first-aid remedies**, etc. Price, **postpaid** **$5.00**

LESSON PLAN

CHEMISTRY HOME STUDY DIVISION

Our Unique New "No Obligation" Plan For Home Study in Practical Chemistry

This plan presents an unprecedented opportunity for you to become a TRAINED CHEMIST. You study at your convenience at home, and pay as you learn. Under this plan you pay only for lessons you order and receive at one time, and are not obligated in advance for your entire course. When you complete your course, you are awarded our certificate of graduation. You are then a *full-fledged professional chemist*, ready for a skilled, well-paying job in chemistry.

You may start with an investment as low as $6.25—and stop there, with no further obligation, no one to make comments or question why you stop, and nobody to insist on your continuing, except as you yourself wish.

Here is the idea of our new Unit Study Plan: $6.25 pays for one unit of our Practical Chemistry Course. (*The entire Course comprises twenty units.*) You may order as many units at one time as your pocketbook and your spare time permit. We suggest that you try our Unit No. 1. When you have completed the first five consecutive units of the Course, and order your sixth unit, our valuable C. I. N. Y. CHEMICAL EXPERIMENTAL LABORATORY OUTFIT, containing 100 items of apparatus and chemical supplies, will be sent you *free of charge*. UNIT No. 1, PRACTICAL CHEMISTRY COURSE **$6.25**

(Sent postpaid)

ORDER DIRECT FROM THIS PAGE

HOW TO ORDER

WE cannot ship C. O. D. Our prices are net as shown; please include sufficient postage for parcel post, as indicated on each item. Books and small items will be shipped parcel post; larger items are shipped by American Railway Express collect. Remit by money order or certified check; if you send cash, please register your letter. *N. B.* Foreign countries, Canada and U. S. Possessions: amount of postage to be included for parcel post shipments should be 50% more than is indicated on each item above. Remittance must be in value of United States currency by international money order, express money order, or draft on New York bank.

WE DO NOT PUBLISH CATALOGS. PLEASE ORDER FROM THIS PAGE.

FOUNDED IN 1921

CHEMICAL INSTITUTE OF NEW YORK INC.

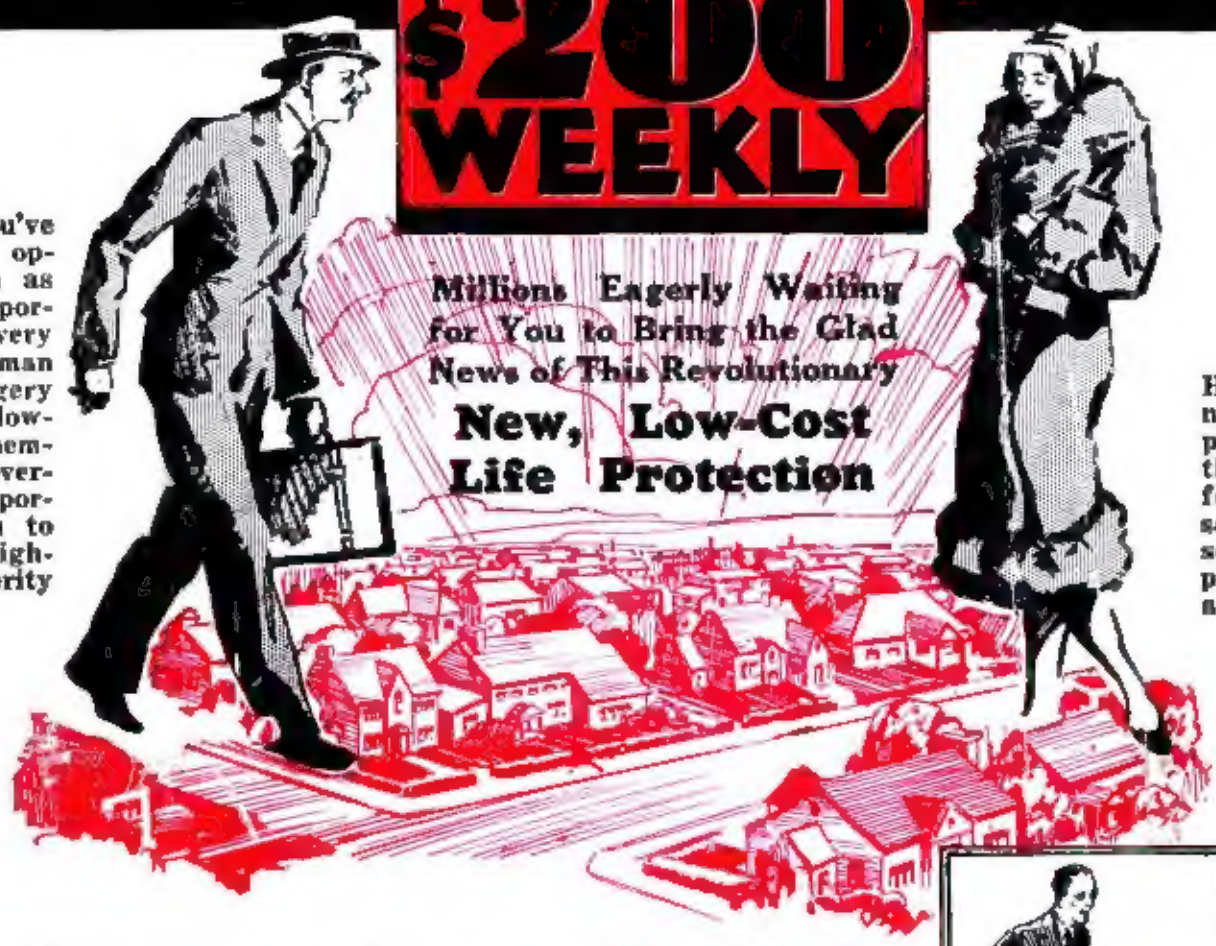
19 Park Place **Dept. W-1232** **New York, N. Y.**

Men! Women!

How would you like to MAKE

up to $200 WEEKLY!

All your life you've longed for an opportunity such as this. It's an opportunity for every man and woman in the drudgery and routine of low-pay jobs, unemployment, or overwork — an opportunity for you to travel the highway of Prosperity and Success!



Here is an absolutely new form of safe, sure protection, unlike anything ever before offered. It's so unusual, so exceedingly liberal, so far-reaching that people are simply amazed.

$5 Profit From Every $6 Order

UP TO $25—$40 DAILY, EASY

Aside from the interesting and enjoyable personal contacts of the humanitarian endeavor of the National Aid Society, the wonderful thing about it is the steady, every-pyramiding income that awaits you. A lavish cash-in-advance profit literally beckons to you from every door—actually $5.00 profit on every $6.00 order!

You do not spend a penny for your selling equipment which you can easily carry in your pocket. It's furnished you entirely FREE. Think of it—write just one $6 order and pocket a Five Dollar profit for it then and there! No waiting for deliveries, no future collections, no C.O.D.'s to be returned. When the deal's closed, it means Cash on the Spot, and it's yours to keep!

A NEW ADVANCED FORM OF PROTECTION

The NATIONAL AID SOCIETY is organized under the laws of Indiana, not for profit, and chartered by the Secretary of that state. Its purpose is to provide protection for all who otherwise could not elsewhere secure such protection excepting only at prohibitive costs. National Aid is NOT an Insurance Company, but, through its liberal cooperative, profit-sharing plan, offers Safe, Sure, LIFE AND PROPERTY PROTECTION MERELY AT COST. Tremendous growth has been accorded this Society ever since its inception, and particularly during the past six months.

AN AMAZING OPPORTUNITY FOR YOU

Your Field Unlimited—

Practically Every Living Person Is Your Prospect!

No Medical Examination! Practically No Age Limits! Because this extremely liberal policy, nearly every living person is a prospective member of NATIONAL AID. You can sell two members to any one person, thereby Doubling these benefits—and double your profits as well.

THIS COUPON BRINGS YOUR FREE STARTING OUTFIT

Begin Making Money Same Hour You Hear from Us!

You can turn this opportunity into Money in your pocket without spending a penny. Learn how our revolutionary new Profit Sharing Plan actually works. Mail the Coupon Now and we'll send you, ENTIRELY FREE AND WITHOUT ANY OBLIGATION WHATSOEVER, everything you need to start. Within ten minute after opening our letter you can step out of your door, call on your neighbors, and START COLLECTING FIVE DOLLAR BILLS! So, don't delay, when your time is so valued. Write your address, and mail coupon NOW.

NATIONAL AID SOCIETY

DEPT. 692 **SPRINGFIELD, ILLINOIS**

MAKE 4 AND 5 SALES AT EVERY CALL

The National Aid Society Plan is original and exclusive. It appeals to every member of every family!—from babe in arms to gray old grandfathers and grandmothers. When you sell one, you sell them all, and the good news spreads from neighbor to neighbor. Often you earn as much in an hour as many people earn in a week of hard labor. $10 to $25 is not the limit of your daily earnings. You can often actually pocket that much at a single call!

RUSH THIS COUPON TODAY!

NATIONAL AID SOCIETY,
Dept. 692 Springfield, Illinois.

Rush me Free Complete Starting Outfit, full details of your Profit-Sharing Plan and Big Money Making proposition.

Name .....

Address .....

City ..... State .....